

CAL POLY
CATALOG
2017 – 2019





California Polytechnic State University
2017-2019 CATALOG

TABLE OF CONTENTS

Welcome to Cal Poly	3	Computer Engineering	216
About the Catalog	4	Computer Science and Software Engineering	219
University Learning Objectives	7	Electrical Engineering	231
University Policies	8	General Engineering	237
Accreditation	17	Industrial & Manufacturing Engineering	240
Academic Calendar 2017-2019	18	Materials Engineering	247
Admissions	20	Mechanical Engineering	251
Financial Information	23	College of Liberal Arts	257
General Requirements – Bachelor's Degree	30	Art & Design	260
Academic Standards and Policies	44	Communication Studies	265
Academic Placement	44	English	268
Academic Standards	48	Ethnic Studies	273
Evaluation of Transfer Credit	52	Graphic Communication	277
Grading	54	History	281
Other Academic Policies	57	Interdisciplinary Studies in the Liberal Arts	285
Registration	59	Journalism	294
Colleges and Programs	63	Music	297
College of Agriculture, Food and Environmental Sciences	63	Philosophy	301
Agribusiness	75	Political Science	304
Agricultural Education & Communication	77	Psychology and Child Development	309
Animal Science	84	Social Sciences	316
BioResource & Agricultural Engineering	95	Theatre & Dance	324
Experience Industry Management	101	Women's and Gender Studies	328
Food Science & Nutrition	108	World Languages and Cultures	331
Horticulture & Crop Science	118	College of Science & Mathematics	336
Military Science	124	Biological Sciences	340
Natural Resources Management and Environmental Sciences	127	Chemistry & Biochemistry	356
Wine and Viticulture	145	Kinesiology and Public Health	362
College of Architecture and Environmental Design	150	Liberal Studies	371
Architectural Engineering	153	Mathematics	376
Architecture	157	Physics	382
City and Regional Planning	161	School of Education	386
Construction Management	166	Statistics	395
Landscape Architecture	169	Interdisciplinary Degree Programs	398
Orfalea College of Business	172	Graduate Education	408
College of Engineering	191	Extended Education	417
Aerospace Engineering	198	Academic Support and Campus Life	418
Biomedical Engineering	203	Academic Services and Programs	418
Civil & Environmental Engineering	209	Academic Advising	418
		Cal Poly International Center	419
		Intercollegiate Athletics	420
		Library Services	420

Pre-Health Career Advising	422
Student Academic Services	422
Testing Services	423
University Honors Program	423
University Studies	424
University Writing & Rhetoric Center	424
Student Resources	424
Campus Health & Wellbeing	424
Career Services	425
Computing at Cal Poly	425
Dean of Students	425
Disability Resource Center	426
Inclusive Excellence	427
LSAMP Program	427
Student Ombuds Services	427
Student Affairs	427
Campus Life	428
Associated Students, Inc.	428
Cal Poly Corporation	430
New Student & Transition Programs	430
Parent and Family Programs	430
Sustainability Practices	431
University Housing	432
University Police	433
Faculty and Staff	434
The CSU System	472
Updates to the Catalog	481
Colleges and Departments	499
Courses A-Z	500
Index	834

WELCOME TO CAL POLY

A Message from President Armstrong



As the 21st Century unfolds, Cal Poly remains firmly committed to the values and traditions that have distinguished Cal Poly since it opened its doors more than a century ago. We seek to transform young adults into resourceful professionals and innovative leaders. At the core of our educational experience is our Learn by Doing philosophy, which provides students the opportunities to apply classroom learning theory to real-world problems. We strive to graduate whole-system thinkers who will be able to help solve the increasingly complex challenges that confront California and the global community.

Undergraduate Emphasis: As a predominantly undergraduate university, Cal Poly is known nationally for the quality of its baccalaureate degree programs in a variety of disciplines. We also offer outstanding master's degree programs.

Residential Campus: Cal Poly is a residential campus. Our students find that the campus environment affords them time, resources and settings in which to discover values and interests – whether in the classroom, academic-related clubs, residence halls, or other extracurricular activities.

Polytechnic Mission: From its inception, Cal Poly has given particular emphasis to instruction in polytechnic disciplines – science, technology, engineering, agriculture, and mathematics. At the same time, we recognize that liberal arts provide a critical and indispensable foundation for all academic disciplines. We are proud of the comprehensive education Cal Poly provides to its students, who graduate as professionals ready to be leaders in industry and society.

Information Technology to Support Teaching and Learning: Cal Poly has been, and continues to be, a leader in the use of information technology to enhance teaching and learning. Students and faculty have access to Internet resources, to course information, to library resources, and to advanced software tools 24 hours a day.

Educational Philosophy: Cal Poly is committed to excellence in teaching and learning. In all disciplines, we seek to provide a student-centered, learner-focused education, facilitated by a low student-teacher ratio in classes conducted primarily by full-time, regular faculty. The cornerstone of our educational philosophy is our commitment to Learn by Doing

whereby classroom instruction is complemented by practical, hands-on learning in the laboratory, the studio, and the field.

Diversity: As a campus, we welcome and nurture a rich array of different perspectives, ideas and cultures. We encourage international and multi-cultural education in order to prepare students for successful participation and competition in a diverse world and a global workforce. We believe that diversity of our students, faculty, and staff enlivens and enriches Cal Poly's educational environment.

We believe these values and our core educational philosophy will sustain us far into the future. Of course, these values alone do not constitute our greatest strength. That strength rests in the quality of the students, faculty, staff, alumni, and friends who make up and who, indeed, are the University.

Jeffrey D. Armstrong
President

ABOUT THE CATALOG

The 2017-2019 Cal Poly Catalog

The *Cal Poly Catalog* is prepared in the Office of the Registrar, Cem Sunata. The Associate Registrar for Curriculum, Catalog and Scheduling is Susan Olivas, Curriculum and Catalog Lead is Stuart Fryer, Catalog Editor is Shayna Bailey, and Curriculum Coordinator is Pamela Bleisch.

A Guide to Using the Catalog

Academic terminology and a university catalog can be confusing to someone first entering the University. This section explains some of the jargon you will quickly come to know and explains briefly how the catalog is organized.

Colleges and Departments

The faculty who supply instruction at Cal Poly hold positions in academic departments, which in turn are grouped into Colleges. All of the academic programs offered by the University are described in the catalog. A complete listing of academic programs at Cal Poly may be found on the Programs A-Z (<http://catalog.calpoly.edu/programsaz>) page.

In the catalog, Colleges are listed in alphabetical order. Departments are also arranged alphabetically within their respective College.

Degrees

A **degree** is an academic rank which the University confers on a student who satisfactorily completes a designated curriculum, or program of study. Cal Poly grants undergraduate degrees – also called baccalaureate degrees – as well as master's degrees.

At the undergraduate level, Cal Poly grants the

- Bachelor of Arts (BA),
- Bachelor of Science (BS),
- Bachelor of Architecture (BArch),
- Bachelor of Fine Arts (BFA), and
- Bachelor of Landscape Architecture (BLA).

At the graduate level, Cal Poly grants the

- Master of Arts (MA),
- Master of Science (MS),
- Master of Agricultural Education (MAGEd),
- Master of Business Administration (MBA),
- Master of City and Regional Planning (MCRP),
- Master of Public Policy (MPP)
- Master of Professional Studies (MPS)

Majors

A **major** is a program of study that provides students with the knowledge, skills and experience necessary to pursue a specific career or advanced study and leads to an undergraduate degree in that subject. Each major is offered in an academic department or program.

Undergraduate applicants to Cal Poly select a major at the time they apply for admission.

General requirements for bachelor's degrees are outlined in General Requirements - Bachelor's Degree (p. 30) and for master's degrees in

Graduate Education (p. 408). The specific requirements for a particular major degree program are listed under the academic department or program that offers the major.

The curriculum display for each bachelor's degree program shows courses arranged by *Major, Support, General Education and Electives*. These curriculum displays are useful guides, but students should consult with their academic advisors.

Information regarding academic advising is available on the Academic Advising (p. 418) page.

Courses

Descriptions of Cal Poly courses are located in Courses A-Z (p. 500), arranged alphabetically by subject area with its corresponding course prefix (an abbreviation that represents the subject or offering department). The courses in a bachelor's degree curriculum are identified as *Major Courses, Support Courses, General Education, and Electives*.

Major Courses are designed to provide competence in the professional field in which a degree is earned. They are usually offered by the academic department in which the degree program is offered, but they may include courses from other departments.

Approved Electives are courses that students can choose from within the parameters set by their departments.

Support Courses provide background needed for major courses and are offered by departments other than the department in which the major is offered. For example, most majors in engineering and in the sciences require support courses in mathematics. Some degree programs do not include support courses.

General Education (GE) courses provide a common foundation of knowledge for all undergraduate programs. GE requirements are described in detail on the General Education (p. 30) page.

Free Electives are courses that students can choose simply to pursue their own interests.

Prerequisites are one or more courses that must be completed, or other knowledge, skills, or standards that must be demonstrated, before a student is permitted to take certain courses. Prerequisites (if any) for a course are listed in the course's description in the catalog.

Some prerequisites have their own prerequisites, forming a string of courses that must all be taken. The catalog course description shows the last course in the prerequisite string of courses. For example, ME 212 Engineering Dynamics has prerequisites of MATH 241; and ME 211 or ARCE 211. MATH 241 Calculus IV requires MATH 143, which requires MATH 142, which requires MATH 141. ME 211 Engineering Statics requires MATH 241; and PHYS 131 or PHYS 141. To enroll in ME 212 Engineering Dynamics, students must have successfully completed MATH 241, MATH 143, MATH 142, MATH 141 and ME 211 or ARCE 211 and PHYS 131 or PHYS 141.

Statements in the catalog course descriptions may also contain the words "**concurrent**" which means that two or more courses must be taken in the same term or "**corequisite**" which means that the course or courses may be taken prior to the course being described (prerequisite) or in the same term (concurrent).

If a student does not meet a requisite as outlined in a course's description, but can demonstrate to an instructor that they have the

necessary knowledge or skills through alternative means, then the instructor may grant the student permission to enroll in the course.

Crosslisted courses are shared by two or more academic units and have identical titles, descriptions, units, modes of instruction and prerequisites. They are interchangeable for degree requirements. They cannot be repeated for degree credit under separate prefixes. Example: HNRS 141 / MATH 141 Calculus I.

Selected Advanced Topics (470s) are generic courses that offer special topics on an "as needed basis." The specific topic appears in the Schedule of Classes and on the students' transcripts.

Topic courses are shown in the catalog with generic titles and are repeatable with different topics. Specific topic titles appear in the Schedule of Classes and on students' transcripts. Example: ENGL 439 Significant British Writers, repeatable to 12 units with different topics (e.g., Jane Austen, Victorian Poets, Hardy).

Other statements in the course descriptions include, "**major credit limit**" (total number of units allowed toward the major) and "**total credit limit**" (total number of units students can take a course for credit).

Course Numbering System

Courses are generally numbered according to the plan shown below.

- 010–099 Pre-baccalaureate courses that are not for degree credit.
- 100–299 Courses primarily for freshman and sophomore students.
- 300–399 Courses primarily for advanced undergraduate students with prerequisite coursework.
- 400–499 Courses for advanced undergraduates. Certain 400-level courses can be used in graduate programs. See General Policies (p. 412) for Graduate Education.
- 500–599 Graduate courses.

Credit Hour

As of July 1, 2011 federal law (Title 34, Code of Federal Regulations, sections 600.2 and 600.4) requires all accredited institutions to comply with the federal definition of the credit hour. For all CSU degree programs and courses bearing academic credit, the "credit hour" is defined as "the amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates not less than:

1. One hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or
2. At least an equivalent amount of work as required in paragraph (1) of this definition for other academic activities as established by the institution, including laboratory work, internships, practice, studio work, and other academic work leading to the award of credit hours."

A credit hour is assumed to be a 50-minute period. In courses in which "seat time" does not apply, a credit hour may be measured by an equivalent amount of work, as demonstrated by student achievement.

Modes of Instruction

The mode of instruction is included in each course description; for supervision/independent study courses, no mode is indicated. Some courses have more than one mode of instruction.

Mode and number of hours classes meet each week

Activity: 2 hours per unit of credit.

Laboratory: 3 hours per unit of credit.

Lecture: 1 hour per unit of credit.

Seminar: 1 hour per unit of credit.

Supervision/Independent Study: Courses involve independent work done by students under the guidance of the faculty and do not meet regularly in a classroom. 3 hours of independent study per week per unit of credit.

Concentrations

A **concentration** is a group of courses designed to provide specialized knowledge within a bachelor's degree program. Completion of a concentration is noted on the student's transcript, but not shown on the diploma.

Specializations

A **specialization** is a similarly specialized group of courses in a master's degree program. Completion of a specialization is noted on the student's transcript and shown on the diploma.

Minors

A **minor** is an integrated, coherent group of courses designed to give a student knowledge in an academic area outside of the major field of study. The minor is completed along with the requirements for the bachelor's degree. For more information and a list including available minors at Cal Poly, see Programs A-Z (<http://catalog.calpoly.edu/programsaz>). Completion of a minor is noted on the student's transcript, but not shown on the diploma.

Graduate Certificates

A **graduate certificate** is designed to provide a specialized area of study that meets the requirements for professional competence and to expand access to specialized knowledge. The subject matter is advanced and narrow in focus.

The programs are typically designed for working professionals who are seeking to advance their career opportunities by obtaining specialized knowledge in their field or in a new field. Completion of the graduate certificate program will be commemorated by a document bearing the University seal and signed by the program's college dean(s) and is noted on the student's transcript.

Quarters and Quarter Units

Cal Poly's academic calendar consists of four quarters – Fall, Winter, Spring and Summer (see Academic Calendar (p. 18)).

Cal Poly's **academic year** consists of Fall, Winter and Spring quarters.

The **university year** includes, and begins with, Summer quarter.

Each course offered by the University carries a value in **quarter units**, often referred to simply as units or credits.

To convert semester units to quarter units, multiply by 1.5. For example, 6 semester units X 1.5 = 9 quarter units.

Changes in Rules and Policies

Although every effort has been made to assure the accuracy of the information in this catalog, students and others who use this catalog should note that laws, rules, and policies change from time to time and that these changes may alter the information contained in this publication. Changes may come in the form of statutes enacted by the Legislature, rules and policies adopted by the Board of Trustees of the California State University, by the Chancellor or designee of the California State University, or by the President or designee of the campus. It is not possible in a publication of this size to include all of the rules, policies and other information that pertain to students, the institution, and the California State University. More current or complete information may be obtained from the appropriate department, school, or administrative office.

Nothing in this catalog shall be construed as, operate as, or have the effect of an abridgment or a limitation of any rights, powers, or privileges of the Board of Trustees of the California State University, the Chancellor of the California State University, or the President of the campus. The Trustees, the Chancellor, and the President are authorized by law to adopt, amend, or repeal rules and policies that apply to students. This catalog does not constitute a contract or the terms and conditions of a contract between the student and the campus or the California State University. The relationship of students to the campus and the California State University is one governed by statute, rules, and policy adopted by the Legislature, the Trustees, the Chancellor, the President and their duly authorized designees.

UNIVERSITY LEARNING OBJECTIVES

A Cal Poly education is the result of experiences taking place in the major and in general education, as well as in the curriculum and co-curriculum. The University Learning Objectives (ULOs) allow these experiences to be aligned to a common set of academic expectations.

The ULOs state that all students who complete an undergraduate or graduate program at Cal Poly should be able to:

1. Think critically and creatively.
2. Communicate effectively.
3. Demonstrate expertise in a scholarly discipline and understand that discipline in relation to the larger world of the arts, sciences, and technology.
4. Work productively as individuals and in groups.
5. Use their knowledge and skills to make a positive contribution to society.
6. Make reasoned decisions based on an understanding of ethics, a respect for diversity, and an awareness of issues related to sustainability.
7. Engage in lifelong learning.

Cal Poly shares some of these expectations with other universities (See ULO 1, 2 and 7). Others reflect Cal Poly's unique character as a comprehensive polytechnic characterized by a preponderance of professional degree programs (ULO 3-6).

ULO 6 states that all Cal Poly graduates should be able to make reasoned decisions based on a respect and appreciation for diversity and an awareness of issues related to sustainability. Because of the complexity of these objectives, the Academic Senate adopted the Diversity Learning Objectives (DLOs) in 2008 and the Sustainability Learning Objectives (SLOs) in 2009, both as addenda to the ULOs.

Diversity Learning Objectives

The DLOs state that all Cal Poly graduates should be able to:

1. Demonstrate understanding of relationships between diversity, inequality, and social, economic, and political power both in the United States and globally
2. Demonstrate understanding of contributions made by individuals from diverse and/or underrepresented groups to our local, national, and global communities
3. Critically examine their own attitudes about diverse and/or underrepresented groups
4. Consider perspectives of diverse groups to inform reasonable decisions
5. Function as members of society and as professionals with people who have ideas, beliefs, attitudes, and behaviors that are different from their own

Please see University Policies (p. 8) for the Statement on Diversity and Non-Discrimination Policy.

Sustainability Learning Objectives

Cal Poly defines sustainability as the ability of the natural and social systems to survive and thrive together to meet current and future needs. The SLOs state that all Cal Poly graduates should be able to:

1. Define and apply sustainability principles within their academic programs.
2. Explain how natural, economic, and social systems interact to foster or prevent sustainability.
3. Analyze and explain local, national, and global sustainability using a multidisciplinary approach.
4. Consider sustainability principles while developing personal and professional values.

Please see Sustainability Practices (p. 431) for more campus sustainability information and the Sustainability Catalog (SUSCAT) (<http://suscat.calpoly.edu>) website for lists of sustainability courses.

Both the DLOs and SLOs should be understood as operating at a level below the institutional level of the ULOs.

Student Learning Assessment

To determine the effectiveness of various educational opportunities, Cal Poly asks students to participate in learning assessments at the course, program, and university levels. These assessments provide a measure of student achievement over the course of their academic careers of course, program, and university learning objectives/outcomes. They may include the direct assessment of student work (assignments, exams, projects, performances, and theses), perhaps using standardized rubrics, as well as surveys and other indirect methods of assessment.

While grades may measure individual student progress, course-, program-, and university-level assessments provide evidence of the effectiveness of educational opportunities for groups of students. This information is intended primarily as the basis for program improvement, although it may also be used for accountability purposes, e.g., documenting educational effectiveness to accreditation agencies.

Students at Cal Poly should expect that their academic work may be used for assessment purposes.

UNIVERSITY POLICIES

Statement on Commitment to Community

The Cal Poly community values a broad and inclusive campus learning experience where its members embrace core values of mutual respect, academic excellence, open inquiry, free expression and respect for diversity. Membership in the Cal Poly community is consistent with the highest principles of shared governance, social and environmental responsibility, engagement and integrity.

As students, faculty and staff of Cal Poly, we choose to:

- Act with integrity and show respect for ourselves and one another
- Accept responsibility for our individual actions
- Support and promote collaboration in University life
- Practice academic honesty in the spirit of inquiry and discovery
- Contribute to the university community through service and volunteerism
- Demonstrate concern for the well-being of others
- Promote the benefits of diversity by practicing and advocating openness, respect and fairness

Individual commitment to these actions is essential to Cal Poly's dedication to an enriched learning experience for all its members.

Statement on Diversity and Inclusivity

The following excerpt is taken from the *Cal Poly Statement on Diversity and Inclusivity*, which has been endorsed by the Cal Poly Academic Senate Resolution AS-807-15 (<http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1807&context=senateresolutions>):

At Cal Poly we believe that academic freedom, a cornerstone value, is exercised best when there is understanding and respect for our diversity of experiences, identities, and world views. Consequently, we create learning environments that allow for meaningful development of self-awareness, knowledge, and skills alongside attention to others who may have experiences, worldviews, and values that are different from our own. In so doing, we encourage our students, faculty, and staff to seek out opportunities to engage with others who are both similar and different from them, thereby increasing their capacity for knowledge, empathy, and conscious participation in local and global communities.

In the spirit of educational equity, and in acknowledgement of the significant ways in which a university education can transform the lives of individuals and communities, we strive to increase the diversity at Cal Poly. As an institution that serves the state of California within a global context, we support the recruitment, retention, and success of talented students, faculty, and staff from across all societies, including people who are from historically and societally marginalized and underrepresented groups.

Cal Poly is an inclusive community that embraces differences in people and thoughts. By being open to new ideas and showing respect for diverse points of view, we support a climate that allows all students, faculty, and staff to feel valued, which in turn facilitates the recruitment and retention of a diverse campus population. We are a culturally invested university whose members take personal responsibility for fostering excellence in our own and others' endeavors. To this end, we support an increased awareness and understanding of how one's own identity facets (such as race, ethnicity, gender, sexual orientation, religion,

age, disability, social class, and nation of origin) and the combinations of these identities and experiences that may accompany them can affect our different worldviews.

- * The definition of diversity is specifically inclusive of, but not limited to, an individual's race/ethnicity, sex/gender, socioeconomic status, cultural heritage, disability, and sexual orientation.

Statement on Sustainability

In 1987, the United Nations' World Commission on Environment and Development defined sustainable development as, "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs." In 2009, Cal Poly's Academic Senate adopted a more academically focused definition of sustainability with the passage of Sustainability Learning Objectives (p. 7):

"Cal Poly defines sustainability as the ability of the natural and social systems to survive and thrive together to meet current and future needs. Cal Poly students should be able to consider sustainability when making reasoned decisions. Students should be able to:

- *Define and apply sustainability principles within their academic programs*
- *Explain how natural, economic, and social systems interact to foster or prevent sustainability*
- *Analyze and explain local, national, and global sustainability using a multidisciplinary approach*
- *Consider sustainability principles while developing personal and professional values"*

As a comprehensive polytechnic university with a hands-on, Learn-by-Doing pedagogy, Cal Poly offers a wide breadth of academic programs in technical disciplines, the arts, and humanities. A Cal Poly education seeks to achieve two distinct but complementary goals – technical knowledge and proficiency in a chosen discipline to prepare for the workplace, and a transformative exposure to diverse cultures and critical thinking to create life-long learners and responsible global citizens.

By definition, sustainability seeks to balance three things - protection of the natural environment, healthy economy, and social justice and equity. As a framework in higher education, sustainability helps foster critical and systems thinking, development of personal and professional ethics, a commitment to environmental stewardship, and inspires students to make positive contributions to human society.

As a Charter Signatory to the Second Nature Climate Commitment, Cal Poly is committed to achieving carbon neutrality and climate resilience as soon as possible, and is infusing this work into curriculum, research, and student experience.

For more information on sustainability at Cal Poly see Sustainability Practices (p. 431).

Policies on the Rights of Individuals

Cal Poly is a community enriched by individual differences. The University is committed to respecting and protecting the rights of individuals. This section presents a summary of University non-discrimination policies and procedures for pursuing complaints under these policies. The Office of Equal Opportunity has been designated to oversee and coordinate implementation of compliance with campus non-discrimination policies.

Except where otherwise indicated, procedures for reporting incidents of discrimination can be found in "Reporting Guidelines."

Non-Discrimination Policy and Complaint Procedures

Protected Status: Age, Genetic Information, Marital Status, Medical Condition, Nationality, Race or Ethnicity (including color or ancestry), Religion or Religious Creed, and Veteran or Military Status.

The California State University does not discriminate on the basis of age, genetic information, marital status, medical condition, nationality, race or ethnicity (including color and ancestry), religion (or religious creed), and veteran or military status – as these terms are defined in CSU policy – in its programs and activities, including admission and access. Federal and state laws, including Title VI of the Civil Rights Act of 1964 and the California Equity in Higher Education Act, prohibit such discrimination. *Brian Gnandt, Director of Equal Opportunity*, has been designated to coordinate the efforts of Cal Poly to comply with all applicable federal and state laws prohibiting discrimination on these bases. Inquiries concerning compliance may be presented to this person at Fischer Science Building 33/290 and/or 805.756.6770 CSU Executive Order 1097 Revised October 5, 2016 (<https://www.calstate.edu/eo/EO-1097-rev-10-5-16.html>) (or any successor executive order) is the systemwide procedure for all complaints of discrimination, harassment or retaliation *made by students* against the CSU, a CSU employee, other CSU students or a third party.

Protected Status: Disability

The California State University does not discriminate on the basis of disability (physical and mental) – as this term is defined in CSU policy – in its programs and activities, including admission and access. Federal and state laws, including sections 504 and 508 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, prohibit such discrimination. *Brian Gnandt, Director of Equal Opportunity*, has been designated to coordinate the efforts of Cal Poly to comply with all applicable federal and state laws prohibiting discrimination on the basis of disability. Inquiries concerning compliance may be presented to this person at Fischer Science Building 33/290 and/or 805.756.6770. CSU Executive Order 1097 Revised October 5, 2016 (<https://www.calstate.edu/eo/EO-1097-rev-10-5-16.html>) (or any successor executive order) is the systemwide procedure for all complaints of discrimination, harassment or retaliation made by students against the CSU, a CSU employee, other CSU students or a third party.

Protected Status: Gender (or sex), Gender Identity (including transgender), Gender Expression and Sexual Orientation

The California State University does not discriminate on the basis of gender (or sex), gender identity (including transgender), gender expression or sexual orientation – as these terms are defined in CSU policy – in its programs and activities, including admission and access. Federal and state laws, including Title IX of the Education Amendments of 1972, prohibit such discrimination. *Brian Gnandt, Director of Equal Opportunity*, has been designated to coordinate the efforts of Cal Poly to comply with all applicable federal and state laws prohibiting discrimination on these bases. Inquiries concerning compliance may be presented to this person at Fischer Science Building 33/290 and/or 805.756.6770. The California State University is committed to providing equal opportunities to all CSU students in all campus programs, including

intercollegiate athletics. CSU Executive Order 1097 Revised October 5, 2016 (<https://www.calstate.edu/eo/EO-1097-rev-10-5-16.html>) (or any successor executive order) is the systemwide procedure for all complaints of discrimination, harassment or retaliation *made by students* against the CSU, a CSU employee, other CSU students or a third party.

Title IX of the Education Amendments of 1972 protects all people regardless of their gender, gender identity, gender expression or sexual orientation from gender discrimination, which includes sexual harassment and violence:

Sex Discrimination means an adverse action taken against a student by the CSU, a CSU employee, or another student because of gender or sex (including sexual harassment, sexual misconduct, domestic violence, dating violence and stalking) that is perpetrated against an individual on a basis prohibited by Title IX of the Education Amendments of 1972, 20 U.S.C. §1681 et seq., and its implementing regulations, 34 C.F.R. Part 106 (Title IX); California Education Code §66250 et seq., and/or California Government Code §11135.

Sexual Harassment, a form of sex discrimination, is unwelcome verbal, nonverbal or physical conduct of a sexual nature that includes, but is not limited to, sexual advances, requests for sexual favors, and any other conduct of a sexual nature where:

1. Submission to, or rejection of, the conduct is explicitly or implicitly used as the basis for any decision affecting a complainant's academic status or progress, or access to benefits and services, honors, programs, or activities available at or through the university; **or**
2. The conduct is sufficiently severe, persistent or pervasive that its effect, whether or not intended, could be considered by a reasonable person in the shoes of the complainant, and is in fact considered by the complainant, as limiting his or her ability to participate in or benefit from the services, activities or opportunities offered by the university; **or**
3. The conduct is sufficiently severe, persistent or pervasive that its effect, whether or not intended, could be considered by a reasonable person in the shoes of the complainant, and is in fact considered by the complainant, as creating an intimidating, hostile or offensive environment.

Sexual harassment could include being forced to engage in unwanted sexual contact as a condition of membership in a student organization; being subjected to video exploitation or a campaign of sexually explicit graffiti; or frequently being exposed to unwanted images of a sexual nature in a classroom that are unrelated to the coursework. Sexual harassment also includes acts of verbal, non-verbal or physical aggression, intimidation or hostility based on gender or sex-stereotyping, even if those acts do not involve conduct of a sexual nature. Executive Order 1097 covers unwelcome conduct of a sexual nature. While romantic, sexual, intimate, personal or social relationships between members of the University community may begin as consensual, they may evolve into situations that lead to sexual harassment or sexual misconduct, including dating or domestic violence, or stalking, subject to this policy. Claiming that the conduct was not motivated by sexual desire is not a defense to a complaint of harassment based on gender.

Sexual Misconduct: All sexual activity between members of the University community must be based on affirmative consent. Engaging in any sexual activity without first obtaining affirmative consent to the specific activity is sexual misconduct, whether or not the

conduct violates any civil or criminal law. Sexual activity includes, but is not limited to, kissing, touching intimate body parts, fondling, intercourse, penetration of any body part, and oral sex. It also includes any unwelcome physical acts, such as unwelcome sexual touching, sexual assault, sexual battery, rape, and dating violence. When based on gender, domestic violence or stalking also constitute sexual misconduct. Sexual misconduct may include using physical force, violence, threat or intimidation, ignoring the objections of the other person, causing the other person's intoxication or incapacitation through the use of drugs or alcohol, or taking advantage of the other person's incapacitation (including voluntary intoxication) to engage in sexual activity. Men as well as women can be victims of these forms of sexual misconduct. Sexual activity with a minor is never consensual when the complainant is under 18 years old, because the minor is considered incapable of giving legal consent due to age.

Sexual Assault is a form of sexual misconduct and is an attempt, coupled with the ability, to commit a violent injury on the person of another because of that person's gender or sex.

Sexual Battery is a form of sexual misconduct and is any willful and unlawful use of force or violence upon the person of another because of that person's gender or sex as well as touching an intimate part of another person against that person's will and for the purpose of sexual arousal, gratification or abuse.

Rape is a form of sexual misconduct and is non-consensual sexual intercourse that may also involve the use of threat of force, violence, or immediate and unlawful bodily injury or threats of future retaliation and duress. Any sexual penetration, however slight, is sufficient to constitute rape. Sexual acts including intercourse are considered non-consensual when a person is incapable of giving consent because s/he is incapacitated from alcohol and/or drugs, is under 18 years old, or if a mental disorder or developmental or physical disability renders the person incapable of giving consent. The respondent's relationship to the person (such as family member, spouse, friend, acquaintance or stranger) is irrelevant.

Acquaintance Rape is a form of sexual misconduct committed by an individual known to the victim. This includes a person the victim may have just met; i.e., at a party, introduced through a friend, or on a social networking website.

Affirmative Consent means an informed, affirmative, conscious, voluntary, and mutual agreement to engage in sexual activity. It is the responsibility of each person involved in the sexual activity to ensure that s/he has the affirmative consent of the other participant(s) to engage in the sexual activity. Lack of protest or resistance does not mean consent nor does silence mean consent. Affirmative consent must be voluntary, and given without coercion, force, threats or intimidation.

- The existence of a dating or social relationship between those involved, or the fact of past sexual activities between them, should never by itself be assumed to be an indicator of affirmative consent. A request for someone to use a condom or birth control does not, in and of itself, constitute affirmative consent.
- Affirmative consent can be withdrawn or revoked. Consent to one form of sexual activity (or sexual act) does not constitute consent to other forms of sexual activity. Consent given to sexual activity on one occasion does not constitute consent on another occasion. There must always be mutual and affirmative consent to engage in sexual activity. Consent must be ongoing throughout a sexual activity and

can be revoked at any time, including after penetration. Once consent is withdrawn or revoked, the sexual activity must stop immediately.

- A person who is incapacitated cannot give affirmative consent. A person is unable to consent when s/he is asleep, unconscious or is incapacitated due to the influence of drugs, alcohol, or medication so that s/he could not understand the fact, nature or extent of the sexual activity. A person is if s/he lacks the mental ability to make informed, rational decisions.
- Whether an intoxicated person (as a result of using alcohol or other drugs) is incapacitated depends on the extent to which the alcohol or other drugs impact the person's decision-making capacity, awareness of consequences, and ability to make fully informed judgments. A person's own intoxication or incapacitation from drugs or alcohol does not diminish that person's responsibility to obtain affirmative consent before engaging in sexual activity
- A person with a medical or mental disability may also lack the capacity to give consent.
- Sexual activity with a minor (a person under 18 years old) is not consensual, because a minor is considered incapable of giving legal consent due to age.
- It shall not be a valid excuse that a person affirmatively consented to the sexual activity if the respondent knew or reasonably should have known that the person was unable to consent to the sexual activity under any of the following circumstances:
 - The person was asleep or unconscious;
 - The person was incapacitated due to the influence of drugs, alcohol or medication, so that the person could not understand the fact, nature or extent of the sexual activity;
 - The person was unable to communicate due to a mental or physical condition
- It shall not be a valid excuse that the respondent believed that the person consented to the sexual activity under either of the following circumstances:
 - The respondent's belief in affirmative consent arose from the intoxication or recklessness of the respondent;
 - The respondent did not take reasonable steps, in the circumstances known to the respondent at the time, to ascertain whether the person affirmatively consented.

Consensual Relationships: Consensual relationship means a sexual or romantic relationship between two persons who voluntarily enter into such a relationship. While sexual and/or romantic relationships between members of the University community may begin as consensual, they may evolve into situations that lead to discrimination, harassment, retaliation, sexual misconduct, dating or domestic violence or stalking.

- A University employee shall not enter into a consensual relationship with a student or employee over whom s/he exercises direct or otherwise significant academic, administrative, supervisory, evaluative, counseling, or extracurricular authority. In the event such a relationship already exists, each campus shall develop a procedure to reassign such authority to avoid violations of this policy.
- This prohibition does not limit the right of an employee to make a recommendation on the personnel matters concerning a family or

household member where the right to make recommendations on such personnel matters is explicitly provided for in the applicable collective bargaining agreement or MPP/confidential personnel plan.

Domestic Violence is abuse committed against someone who is a current or former spouse, current or former cohabitant, someone with whom the respondent has a child, someone with whom the respondent has or had a dating or engagement relationship, or a person similarly situated under California domestic or family violence law. Cohabitant means two unrelated persons living together for a substantial period of time, resulting in some permanency of relationship. It does not include roommates who do not have a romantic, intimate, or sexual relationship. Factors that may determine whether persons are cohabiting include, but are not limited to (1) sexual relations between the parties while sharing the same living quarters, (2) sharing of income or expenses, (3) joint use or ownership of property, (4) whether the parties hold themselves out as spouses, (5) the continuity of the relationship, and (6) the length of the relationship. For purposes of this definition, "abuse" means intentionally or recklessly causing or attempting to cause bodily injury or placing another person in reasonable apprehension of imminent serious bodily injury to himself or herself, or another. Abuse does not include non-physical, emotional distress or injury.

Dating Violence is abuse committed by a person who is or has been in a social or dating relationship of a romantic or intimate nature with the victim. This may include someone the victim just met; i.e., at a party, introduced through a friend, or on a social networking website. For purposes of this definition, "abuse" means intentionally or recklessly causing or attempting to cause bodily injury or placing another person in reasonable apprehension of imminent serious bodily injury to himself or herself, or another. Abuse does not include non-physical, emotional distress or injury.

Stalking means engaging in a repeated course of conduct directed at a specific person that would cause a reasonable person to fear for his/her or others' safety or to suffer substantial emotional distress. For purposes of this definition:

- Course of conduct means two or more acts, including but not limited to, acts in which the stalker directly, indirectly, or through third parties, by any action, method, device, or means, follows, monitors, observes, surveils, threatens, or communicates to or about a person, or interferes with a person's property;
- Reasonable person means a reasonable person under similar circumstances and with the same protected status(es) as the complainant;
- Substantial emotional distress means significant mental suffering or anguish that may, but does not necessarily, require medical or other professional treatment or counseling.

See further:

CSU Systemwide Executive Order 1095:

<https://www.calstate.edu/eo/EO-1095-rev-6-23-15.pdf>

CSU Systemwide Executive Order 1096:

<https://www.calstate.edu/eo/EO-1096-rev-10-5-16.pdf>

CSU Systemwide Executive Order 1097:

<https://www.calstate.edu/eo/EO-1097-rev-6-23-15.html>

Whom to Contact If You Have Complaints, Questions or Concerns

Title IX requires the University to designate a Title IX Coordinator to monitor and oversee overall Title IX compliance. The campus Title IX Coordinator is available to explain and discuss the right to file a criminal complaint (for example, in cases of sexual misconduct); the University's complaint process, including the investigation process; how confidentiality is handled; available resources, both on and off campus; and other related matters. ***If you are in the midst of an emergency, please call the police immediately by dialing 9-1-1.***

CAL POLY TITLE IX COORDINATOR:

Brian Gnanndt, Director of Equal Opportunity
Location: Fischer Science Building 33/290
Phone: 805.756.6770
Email: bgnandt@calpoly.edu

CAL POLY UNIVERSITY POLICE

Emergency: Dial 911
Non-emergency: 805.756.2281 or Email: police@calpoly.edu
<https://afd.calpoly.edu/police/>

Title IX requires the University to adopt and publish complaint procedures that provide for prompt and equitable resolution of gender discrimination complaints, including sexual harassment and misconduct, as well as provide training, education and preventive measures related to sex discrimination. CSU Executive Order 1097 (<https://www.calstate.edu/eo/EO-1097-rev-10-5-16.html>) (or any successor executive order) is the systemwide procedure for all complaints of discrimination, harassment or retaliation ***made by students*** against the CSU, a CSU employee, other CSU students or a third party.

Duty to Report. Except as provided below under confidentiality and sexual misconduct, dating violence, domestic violence, and stalking, any University employee who knows or has reason to know of allegations or acts that violate University policy shall promptly inform the Title IX Coordinator. These employees are required to disclose all information including the names of the parties, **even where the person has requested that his/her name remain confidential.** The Title IX Coordinator will determine whether confidentiality is appropriate given the circumstances of each such incident. (See confidential reporting options outlined below.)

Regardless of whether an alleged victim of gender discrimination ultimately files a complaint, if the campus knows or has reason to know about possible sexual discrimination, harassment or misconduct, it must review the matter to determine if an investigation is warranted. The campus must then take appropriate steps to eliminate any gender discrimination/harassment/misconduct, prevent its recurrence, and remedy its effects.

Safety of the Campus Community is Primary

The University's primary concern is the safety of its campus community members. The use of alcohol or drugs never makes the victim at fault for gender discrimination, harassment or misconduct; therefore, victims should not be deterred from reporting incidents of sexual misconduct out of a concern that they might be disciplined for related violations of drug, alcohol or other University policies. Except in extreme circumstances,

victims of sexual misconduct shall not be subject to discipline for related violations of the Student Conduct Code.

Information Regarding Campus, Criminal and Civil Consequences of Committing Acts of Sexual Violence

Individuals alleged to have committed sexual misconduct may face criminal prosecution by law enforcement and may incur penalties as a result of civil litigation. In addition, employees and students may face discipline at the University, up to and including suspension or expulsion. Employees may face sanctions up to and including dismissal from employment, pursuant to established CSU policies and provisions of applicable collective bargaining unit agreements.

Students who are charged by the University with gender discrimination, harassment or misconduct will be subject to discipline, pursuant to the California State University Student Conduct Procedures (see Executive Order 1098 at <https://www.calstate.edu/eo/EO-1098-rev-6-23-15.html> or any successor executive order) and will be subject to appropriate sanctions. In addition, during any investigation, the University may implement interim measures in order to maintain a safe and non-discriminatory educational environment. Such measures may include but not be limited to immediate interim suspension from the University; a required move from University-owned or affiliated housing; adjustments to course schedule; and/or prohibition from contact with parties involved in the alleged incident.

Confidentiality and Sexual Violence, Dating Violence, Domestic Violence and Stalking

The University encourages victims of sexual misconduct, dating violence, domestic violence or stalking to talk to someone about what happened – so they can get the support they need, and so the University can respond appropriately.

Privileged and Confidential Communications

Physicians, Psychotherapists, Professional Licensed Counselors, Licensed Clinical Social Workers, and Clergy – Physicians, psychotherapists, professional, licensed counselors, licensed clinical social workers, and clergy who work or volunteer on or off campus, acting solely in those roles or capacities as part of their employment, and who provide medical or mental health treatment or counseling (and those who act under their supervision, including all individuals who work or volunteer in their centers and offices) including those who act in that role under their supervision) may not report any information about an incident of sexual misconduct to anyone else at the University, including the Title IX Coordinator, without the victim's consent. A victim can seek assistance and support from physicians, psychotherapists, professional, licensed counselors, licensed clinical social workers and clergy without triggering a University investigation that could reveal the victim's identity or the fact of the victim's disclosure. However, see limited exceptions below regarding when health care practitioners must report to local law enforcement agencies. Health care practitioners should explain these limited exceptions to victims, if applicable.

Sexual Assault and Domestic Violence Counselors and Advocates – Sexual assault and domestic violence counselors and advocates who work or volunteer on or off campus in sexual assault centers, victim advocacy offices, women's centers and health centers and who are acting solely in that role (including those who act in that role under their supervision, along with non-professional counselors or advocates who work or volunteer in sexual assault centers, victim advocacy offices, women's centers, gender equity centers, or health centers), may talk to a victim without revealing any information about the victim and the

incident of sexual misconduct to anyone else at the University, including the Title IX Coordinator, without the victim's consent. A victim can seek assistance and support from these counselors and advocates without triggering a University investigation that could reveal his/her identity or that a victim disclosed an incident to them. However, see limited exceptions below regarding when sexual assault and domestic violence counselors and advocates must report to local law enforcement agencies. Counselors and advocates should explain these limited exceptions to victims, if applicable.

The University will be unable to conduct an investigation into a particular incident or pursue disciplinary action against a perpetrator if a victim chooses to (1) speak only to a physician, professional licensed counselor, licensed clinical social worker, clergy member, sexual assault counselor, domestic violence counselor or advocate; and (2) maintain complete confidentiality. Even so, these individuals will assist victims in receiving other necessary protection and support, such as victim advocacy, disability, medical/health or mental health services, or legal services, and will advise victims regarding their right to file a Title IX complaint with the University and a separate complaint with local or University Police. If a victim insists on confidentiality, such professionals, counselors and advocates will likely not be able to assist the victim with: University academic support or accommodations; changes to University-based living or working schedules; or adjustments to course schedules. A victim who at first requests confidentiality may later decide to file a complaint with the University or report the incident to the police, and thus have the incident fully investigated. These counselors and advocates can provide victims with that assistance if requested by the victim. These counselors and advocates will also explain that Title IX includes protections against retaliation, and that the University will not only take steps to prevent retaliation when it knows or reasonably should know of possible retaliation, but will also take strong responsive action if it retaliation occurs.

EXCEPTIONS: Under California law, any health practitioner employed in a health facility, clinic, physician's office, or local or state public health department or clinic is required to make a report to local law enforcement if he or she provides medical services for a **physical condition** to a patient/victim who he or she knows or reasonably suspects is suffering from (1) a wound or physical injury inflicted by a firearm; or (2) any wound or other physical injury inflicted upon a victim where the injury is the result of assaultive or abusive conduct (including sexual misconduct, domestic violence, and dating violence). This exception does **not** apply to sexual assault and domestic violence counselors and advocates. Health care practitioners should explain this limited exception to victims, if applicable.

Additionally, under California law, **all** professionals described above (physicians, psychotherapists, professional counselors, licensed clinical social workers, clergy, and sexual assault and domestic violence counselors and advocates) are mandatory child abuse and neglect reporters, and are required to report incidents involving victims under 18 years of age to local law enforcement. These professionals will explain this limited exception to victims, if applicable.

Finally, some or all of these professionals may also have reporting obligations under California law to: (1) local law enforcement in cases involving threats of immediate or imminent harm to self or others where disclosure of the information is necessary to prevent the threatened danger; or (2) to the court if compelled by court order or subpoena in a criminal proceeding related to the sexual misconduct, dating or domestic

violence, or stalking incident. If applicable, these professionals will explain this limited exception to victims.

Reporting to University or Local Police

If a victim reports to local or University Police about sexual misconduct crimes, the police are required to notify victims that their names will become a matter of public record unless confidentiality is requested. If a victim requests that his/her identity be kept confidential, his/her name will not become a matter of public record and the police will not report the victim's identity to anyone else at the University, including the Title IX Coordinator. University Police will, however, report the facts of the incident itself to the Title IX Coordinator being sure not to reveal to the Title IX Coordinator victim names/identities or compromise their own criminal investigation. The University is required by the federal Clery Act to report certain types of crimes (including certain sex offenses) in statistical reports. However, while the University will report the type of incident in the annual crime statistics report known as the Annual Security Report, victim names/identities will not be revealed.

Reporting to the Title IX Coordinator and Other University Employees

Most University employees have a duty to report incidents of sexual misconduct when they are on notice of it. When a victim tells the Title IX Coordinator or another University employee about an incident of sexual misconduct, the victim has the right to expect the University to take immediate and appropriate steps to investigate what happened and to resolve the matter promptly and equitably. In all cases, the University strongly encourages victims to report incidents of sexual misconduct directly to the campus Title IX Coordinator. As detailed above, in the "Privileged and Confidential Communications" section of this policy, all University employees except physicians, licensed professional counselors, licensed clinical social workers, sexual assault counselors and advocates, must report to the Title IX Coordinator all relevant details about any incidents of sexual misconduct of which they become aware. The University will need to determine what happened – and will need to know the names of the victim(s) and the perpetrator(s), any witnesses, and any other relevant facts, including the date, time and specific location of the incident.

To the extent possible, information reported to the Title IX Coordinator or other University employees will be shared only with individuals responsible for handling the University's response to the incident. The University will protect the privacy of individuals involved in a sexual misconduct violence incident except as otherwise required by law or University policy. A report of sexual misconduct may result in the gathering of extremely sensitive information about individuals in the campus community. While such information is considered confidential, University policy regarding access to public records and disclosure of personal information may require disclosure of certain information concerning a report of sexual misconduct. In such cases, efforts will be made to redact the records, as appropriate, in order to protect the victim's identity and privacy and the privacy of other involved individuals. Except as detailed in the section on "Privileged and Confidential Communications" above, no University employee, including the Title IX Coordinator, should disclose the victim's identity to the police without the victim's consent or unless the victim has also reported the incident to the police.

If a victim requests of the Title IX Coordinator or another University employee that his/her identity remain completely confidential, the Title IX Coordinator will explain that the University cannot always honor that request or guarantee complete confidentiality. If a victim wishes

to remain confidential or request that no investigation be conducted or disciplinary action taken, the University must weigh that request against the University's obligation to provide a safe, non-discriminatory environment for all students, employees, and third parties, including the victim. Under those circumstances, the Title IX Coordinator will determine whether the victim's request for complete confidentiality and/or no investigation can be honored under the facts and circumstances of the particular case, including whether the University has a legal obligation to report the incident, conduct an investigation or take other appropriate steps. Without information about a victim's identity, the University's ability to meaningfully investigate the incident and pursue disciplinary action against the perpetrator may be severely limited. See Executive Order 1095 (or any successor executive order) for further details around confidential reporting, and other related matters (<https://www.calstate.edu/eo/EO-1095-rev-6-23-15.html>).

LOCAL COMMUNITY RESOURCE INFORMATION:

Cal Poly Counseling Center

805.756.2511

<https://hcs.calpoly.edu/content/counseling/counseling-home>

Cal Poly Health Services

805.756.1211

Hearing or Speech Impaired: Call 711 (Telecommunications Relay Service)

<https://hcs.calpoly.edu/>

Cal Poly Safer

805.756.2282

<https://safer.calpoly.edu/>

RISE

Respect | Inspire | Support | Empower

855.886.7473

<http://www.riseslo.org/>

Protection from Retaliation

It is critical that individuals not be deterred from reporting possible prohibited harassment. CSU policy [Executive Order 1097] prohibits retaliation against individuals who have or are believed to have filed a discrimination complaint, opposed a discriminatory act, or participated in a discrimination investigation or proceeding.

Reporting Guidelines

Individuals with inquiries regarding the application of these laws, regulations and policies to programs and activities of California Polytechnic State University, or those wishing to file a complaint alleging a violation of these policies, may contact the office of Equal Opportunity, Fisher Science (Bldg. 33), Room 290, 805.756.6770, <http://www.equalopportunity.calpoly.edu/>, or other designated campus offices as indicated in the following administrative guidelines.

- Students may obtain confidential, informal, impartial, and independent advice about any university-related concerns from Student Ombuds Services, Robert E. Kennedy Library (Bldg. 35), Room 113, 805.756.1380, <http://ombuds.calpoly.edu>. Working with Student Ombuds Services does not constitute official notice to the University of alleged policy violations except for allegations of sexual violence.
- Complaints from or about students alleging violations of these policies by other students may be directed to the office of the Vice President for Student Affairs, Administration Building (Bldg. 01), Room 209, 805.756.1521; the office of the Dean of Students, Student

Health Center (Bldg. 17), Room 113, 805.756.0327; or the office of Student Rights and Responsibilities, Student Services Building (Bldg. 124), 805.756.0327.

- Student disability-related complaints may be directed to the Disability Resource Center, Student Services (Bldg. 124), Room 119, 805.756.1395.
- Students wishing to seek additional information or file a complaint not previously addressed should contact the office of Equal Opportunity, Fisher Science (Bldg. 33), Room 290, 805.756.6770, for assistance.
- Complaints by or against employees who are covered by either collective bargaining agreements or CSU system-wide procedures shall be processed in accordance with the applicable collective bargaining agreement or systemwide procedures. Questions should be directed to the office of the Associate Vice Provost for Academic Personnel, Administration (Bldg. 01), Room 314, 805.756.2844 for faculty matters; and the office of the Director of Human Resources, Administration (Bldg. 01), Room 110, 805.756.6564, for staff or management issues.
- Complaints from non-represented employees or Independent Contractors may be directed to the office of Equal Opportunity, Fisher Science (Bldg. 33), Room 290, 805.756.6770.
- Complaints by or against employees of the Cal Poly Corporation must follow the Corporation's "Procedures for Resolving Harassment Complaints." Any such complaints should be directed to either her or his supervisor or the Advisor on Harassment Concerns, Corporation Building (15), 805.756.1151. www.calpolycorporation.org/docs/policies/pm207.pdf (<http://www.calpolycorporation.org/docs/policies/pm207.pdf>)
- Employees and students of Associated Students, Inc., comply with University policies. Employees of Associated Students, Inc., or others who believe that they have been discriminated against can file a complaint using the ASI "Policy Prohibiting Harassment." www.asi.calpoly.edu/forms_and_policies (Policy Manuals, ASI Personnel Policy Manual)
- If an act of discrimination is alleged to have occurred over the campus's information resources infrastructure—telephones, computers, network, etc.—redress may be through Information Technology Service's "Responsible Use Policy." Initial inquiries regarding violations should be directed to the office of the Vice Provost and Chief Information Officer, (Bldg. 14), Room 113, 805.756.5541.

Inquiries concerning the application of these laws to programs and activities of California Polytechnic State University may also be referred to the specific campus officers identified above or to the Regional Director of the Office for Civil Rights, United States Department of Education, 50 Beale Street, Suite 7200, San Francisco, California 94105.

Filing a complaint about discrimination with the University is not a prerequisite to filing a complaint with a federal or state agency.

Academic Freedom

Cal Poly recognizes and supports the principle of academic freedom, by which each instructional faculty member, researcher, librarian and counselor has the right to teach, to conduct research, and to publish material relevant to that faculty member's discipline, even when such material is controversial.

The University also guarantees to its faculty the same rights shared by all citizens, which include:

- the right to free expression,
- the right to assemble, and
- the right to criticize and seek revision of the institution's regulations.

At the same time, the faculty should recognize an equally binding obligation to perform their academic duties responsibly and to comply with the internal regulations of the University.

Each faculty member is expected to recognize the right of free expression of other members of the university community; intolerance and personal abuse are unacceptable.

Faculty shall not claim to be representing the University unless authorized to do so.

Cal Poly endorses the nationally recognized definition of academic freedom from the American Association of University Professors (AAUP): The 1940 Statement of Principles on Academic Freedom and Tenure with 1970 Interpretative Notes, as follows:

1. Teachers¹ are entitled to full freedom in research and in the publication of results, subject to the adequate performance of their other academic duties; but research, for pecuniary return, should be based upon an understanding with the authorities of the institution.
2. Teachers are entitled to freedom in the classroom in discussing their subject, but they should be careful not to introduce into their teaching controversial subject matter which has no relation to the subject.² Limitations of academic freedom because of religious or other aims of the institution should be clearly stated in writing at the time of appointment.
3. College and university teachers are citizens, members of a learned profession, and officers of an educational institution. When they speak or write as citizens, they should be free from institutional censorship or discipline, but their special position in the community imposes special obligations. As scholars and educational officers, they should remember that the public may judge their profession and institution by their utterances. Hence, they should at all times be accurate, should exercise appropriate restraints, should show respect for the opinions of others, and should make every effort to indicate they are not speaking for the institution.

¹ The footnote from the 1940 Statement states: "The word 'teacher' as used in this document is understood to include the investigator who is attached to an academic institution without teaching duties." Reference: AAUP: The 1940 *Statement of Principles on Academic Freedom and Tenure with 1970 Interpretative Notes*, adopted by the Council of the American Association of University Professors in April 1970 and endorsed by the Fifty-sixth Annual Meeting as Association policy, www.aaup.org/AAUP/pubsres/policydocs/contents/1940statement.htm (<http://www.aaup.org/AAUP/pubsres/policydocs/contents/1940statement.htm>)

² The footnote from the 1970 Interpretative Notes on the AAUP Statement reads: "The intent of this statement is not to discourage what is 'controversial.' Controversy is at the heart of free academic inquiry which the entire statement is designed to focus. The passage serves to underscore the need for teachers to avoid persistently intruding material which has no relation to the subject."

Student Academic Rights & Responsibilities

The classroom (including laboratories, field trips, independent study, etc.) is the essential part of any university where freedom to learn should flourish. The instructor has the responsibility for the manner of instruction and the conduct of the classroom. The instructor should not act in any way that denies the rights of students as set forth below:

Students are free to take reasoned exception to the data or views offered in courses. It is the responsibility of the instructor to take every precaution to ensure that what is presented is factual. If the instructor's presentation is in the area of opinion, belief, or debatable fact, it is the instructor's responsibility to make this clear to the students. Students may be required to know thoroughly the particulars set forth by the instructor, but they are free to reserve personal judgment as to that which is presented in the classroom.

The student has the right to substantial presentations appropriate to the course. Unjustified failure of the instructor to meet or prepare for classes, which results in incompetent performance, is a legitimate ground for student complaints against the instructor.

The student has the right to a statement at the beginning of each quarter providing: instructor's name, office location, office telephone number, and office hours; texts and supplementary materials required for the course; purpose of the course; prerequisites; requirements for grading; frequency and types of tests; and other information to assure student's understanding of the nature and requirements of the course.

A **Fairness Board** has been established to hear grievances of students who believe their academic rights have been denied or violated. The legitimacy of the process and procedure of evaluation in the course shall be the sole criterion of the Fairness Board. Students may contact the Academic Senate at 805.756.1258, www.academicsenate.calpoly.edu/ for clarification of the description and procedures for the Fairness Board and the appeal process for grade disputes. Students should address grade disputes involving allegations of academic dishonesty to the Office of Student Rights & Responsibilities at 805.756.2794. Students may also contact the University Ombuds at 805.756.1380 for informal assistance with grade disputes.

Academic Responsibilities

Students enrolled in a class are responsible for meeting standards of performance and conduct established by the University and the instructor. Students are responsible for registering and "adding" and "dropping" classes in a timely fashion, to ensure that others have an opportunity to take classes. Students are responsible for completing and submitting all class assignments, examinations, tests, projects, reports, etc., by scheduled due dates, or face penalties. If any problem arises regarding course work or attendance, the student is held responsible for initiating communication and contact with the instructor. In addition, students are held responsible for behavior and conduct adverse to the preservation of order as established by the University and the instructor. Students are responsible for meeting their degree requirements as provided in the university catalog.

Cheating and Plagiarism

Cal Poly does not tolerate academic cheating or plagiarism in any form.

Learning to think and work independently is part of the educational process.

Cheating or plagiarism in any form is considered a serious violation of expected student behavior and may result in disciplinary action. All faculty and students are encouraged to review the formal policy on cheating and plagiarism (including definitions, sanctions, and appeal procedures) found in the Campus Administrative Manual, Section 684.

University policy can be summarized simply:

As a student, you are responsible for your own work and you are responsible for your actions.

Use and Release of Student Information

https://registrar.calpoly.edu/ferpa_summary

The Family Educational Rights and Privacy Act (FERPA) affords students certain rights with respect to their education records. This federal law applies to all schools that receive funding under most programs administered by the Department of Education. The primary rights afforded each student are the right to inspect and review his/her education records, the right to seek to have the records amended, and the right to have some control over the disclosure of information from the records.

Responsible Use of Information Technology Resources

Information technology resources are provided to support the University's mission of education, research and service. To ensure that these shared and finite resources are used effectively to further the University's mission, each user has the responsibility to:

- Use the resources appropriately and efficiently
- Respect the freedom and privacy of others
- Protect the stability and security of the resources
- Understand and fully abide by established University policies and applicable public laws

The Responsible Use Policy covers authorized use, data security, confidentiality and privacy, copyright infringement and more. All students, faculty and staff acknowledge the policy each time they change their my.calpoly.edu passwords. It can also be viewed by visiting: <http://www.security.calpoly.edu/content/policies/rup/index>

E-Mail - an Official Means of Communication to Students

www.servicedesk.calpoly.edu/content/email_calendar/policy/email_communications_students

Campus email is an official method of campus communication to students, and may be used as the sole method of communication for some campus matters. Official university communications are sent to a student's university-assigned e-mail address (username@calpoly.edu). Students are responsible for receiving and reading official email communications in a timely manner and for taking necessary action when appropriate. This also applies when university emails are redirected to a non-university email account.

Campus policy permits colleges, departments, and faculty to use email to send official communications to students, for example, messages pertaining to the conduct of university business for academic or administrative purposes. Using email for such purposes is at the

discretion of the sender and in no way precludes the use of other communication methods.

For more information about the campus email policy and related standards and practices, including frequently asked questions, visit http://www.servicedesk.calpoly.edu/content/email_calendar/policy/guidelines_overview.

Accessibility of Cal Poly Electronic and Information Technology Resources

<http://accessibility.calpoly.edu>

The Americans with Disabilities Act (ADA) provides that no qualified individual with a disability be denied access to or participation in services, programs, and activities at Cal Poly. This act applies to virtually all aspects of campus activities, including employment, teaching and learning, and services provided to the campus community.

It is the policy of the California State University system to make information technology resources and services accessible to all CSU students, faculty, staff, and the general public regardless of disability status. Cal Poly is committed to ensuring that university information and services delivered electronically are made accessible and the needs of individual students and employees with disabilities are accommodated. For more information regarding Cal Poly plans and policies and related standards and practices related to accessibility, visit <http://accessibility.calpoly.edu>.

Copyright Infringement and File Sharing: What Students Need to Know

<http://security.calpoly.edu/content/faq/dmca-faqs>

In recent years, copyright holders, like the Recording Industry Association of America (RIAA), have stepped up legal efforts to combat infringement, which includes targeting college students with an increased number of copyright Infringement notices. Here's what you should know:

- Hundreds of Cal Poly students receive copyright Infringement notices each year.
- You can receive a notice for downloading or for allowing others to upload content from your computer. If you have file sharing software on your computer, you may be distributing copyrighted materials anytime your computer is on the network.
- If you receive a notice for inappropriate activity on the campus network, your network access will be temporarily disabled and you will be required to complete specific actions before access is reinstated.
- Repeat offenders will be referred to the Office of Student Rights and Responsibilities for further disciplinary action.

Please review these frequently asked questions to learn more about peer-to-peer file sharing and copyright infringement, the potential dangers and penalties you may incur from file sharing, and what you can do to protect yourself and your computer: <http://security.calpoly.edu/content/faq/dmca-faqs>.

Information Security Program

<http://security.calpoly.edu>

Information security is everyone's responsibility. Only you can protect your personal devices and information. By following some basic security

practices, you can help protect university data and devices you access, as well as your own. This includes using anti-virus and other technical safeguards, keeping software and operating systems up-to-date, using strong passwords, not responding to "phishing" emails, and avoiding unsecured network connections.

It is the collective responsibility of all users to ensure:

- Confidentiality of information which Cal Poly must protect from unauthorized access
- Integrity and availability of information stored on or processed by Cal Poly information systems
- Campus compliance with applicable laws, regulations, and policies governing information security and privacy protection.

Cal Poly's Information Security Office provides direction to the campus to accomplish the above while not inhibiting the sanctioned use of campus information assets as required to meet the university's core mission and academic and administrative goals. To help safeguard and secure campus information and information resources, all users and campus departments are expected to adhere to these policies and standards where applicable. Please report suspected violations and questions to security@calpoly.edu.

ACCREDITATION

The University is fully accredited by the Western Association of Schools and Colleges (WASC), Senior College and University Commission.

WASC is a regional accrediting agency that is recognized by the U.S. Department of Education as certifying institutional eligibility for federal funding in a number of programs, including student access to federal financial aid. WASC may be contacted at:

Western Association of Schools and Colleges
985 Atlantic Avenue, Suite 100
Alameda, California 94501
Phone: 510.748.9001

During the process of reaffirming its accreditation, Cal Poly completes a self-study and then undergoes a review by a WASC team representing institutional peers. After last completing this process in Spring of 2012, Cal Poly received a full ten-year extension of its accreditation, i.e., until spring of 2022. More information about this process may be found at wasc.calpoly.edu.

Program Accreditation. The School of Education offers teaching and service credentials which are fully accredited by California Commission on Teacher Credentialing (CCTC). The credentials are described in catalog sections Teaching Credential Programs (p. 386) and Graduate Programs (p. 386) in the School of Education (p. 386) section of this Catalog.

In addition, Cal Poly has a number of accredited degree programs:

Program	Accrediting Agency
Accounting, MS	Association to Advance Collegiate Schools of Business (AACSB)
Art and Design, BFA	National Association of Schools of Art and Design (NASAD)
Architecture, BArch	National Architectural Accrediting Board (NAAB)
Business Administration, BS, MBA	Association to Advance Collegiate Schools of Business (AACSB)
Business and Technology, MS	Association to Advance Collegiate Schools of Business (AACSB)
City and Regional Planning, BS, MCRP	Planning Accreditation Board (PAB)
Computer Science, BS	Computing Accreditation Commission of ABET ¹
Construction Management, BS	American Council for Construction Education (ACCE)
Dietetic Internship	Accreditation Council for Education in Nutrition and Dietetics (ACEND)
Economics, BS	Association to Advance Collegiate Schools of Business (AACSB)
Engineering Management, MBA/MS	Association to Advance Collegiate Schools of Business (AACSB)
Engineering Programs:	
Aerospace Engineering, BS	Engineering Accreditation Commission of ABET ¹
Architectural Engineering, BS	Engineering Accreditation Commission of ABET ¹

Biomedical Engineering	Engineering Accreditation Commission of ABET ¹
BioResource and Agricultural Engineering, BS	Engineering Accreditation Commission of ABET ¹
Civil Engineering, BS	Engineering Accreditation Commission of ABET ¹
Computer Engineering, BS	Engineering Accreditation Commission of ABET ¹
Electrical Engineering, BS	Engineering Accreditation Commission of ABET ¹
Environmental Engineering, BS	Engineering Accreditation Commission of ABET ¹
Industrial Engineering, BS	Engineering Accreditation Commission of ABET ¹
Manufacturing Engineering, BS	Engineering Accreditation Commission of ABET ¹
Materials Engineering, BS	Engineering Accreditation Commission of ABET ¹
Mechanical Engineering, BS	Engineering Accreditation Commission of ABET ¹
Software Engineering, BS	Engineering Accreditation Commission of ABET ¹
Forestry and Natural Resources, BS	Society of American Foresters (SAF)
Graphic Communication, BS	Accrediting Counsel for Collegiate Graphic Communications (ACCGC)
Industrial Technology and Packaging, BS	Association of Technology, Management, and Applied Engineering (ATMAE); Association to Advance Collegiate Schools of Business (AACSB)
Landscape Architecture, BLA	American Society of Landscape Architects (ASLA), Landscape Architectural Accreditation Board (LAAB)
Music, BA	National Association of Schools of Music (NASM)
Nutrition, BS (Applied Nutrition Concentration)	Accreditation Council for Education in Nutrition and Dietetics (ACEND)
Recreation, Parks, and Tourism Administration, BS	Council on Accreditation of Parks, Recreation, Tourism and Related Professions (COAPRT)

¹ www.abet.org (<http://www.ABET.org>)

ACADEMIC CALENDAR 2017-2019

Please note: This is not intended to be construed as an employee work calendar.

Summer Term 2017

Date	Event
June 22, Thursday	Beginning of university year; Beginning of summer term - classes beginning
July 4, Tuesday	Academic holiday – Independence Day observed
July 6, Thursday	End of second week of instruction
July 13, Thursday	End of third week of instruction – Census date
August 10, Thursday	End of seventh week of instruction
August 29, Tuesday	Last day of classes for 10-week session
August 30-September 1, Wednesday-Friday	Final examination period
September 1, Friday	End of summer term
September 2-6, Saturday-Wednesday	Academic holiday

Fall Term 2017

Date	Event
September 7, Thursday	Beginning of fall term (faculty only)
September 14, Thursday	Fall term classes begin
September 27, Wednesday	End of second week of instruction
October 4, Wednesday	End of third week of instruction – Census date
November 1, Wednesday	End of seventh week of instruction
November 10, Friday	Academic holiday – Veterans' Day observed
November 20-26, Monday-Sunday	Academic holiday – Thanksgiving
December 1, Friday	Last day of classes
December 2, Saturday	Common final exams (optional)
December 4-8, Monday-Friday	Final examination period
December 9, Saturday	Mid-Year Commencement, End of fall term
December 10– January 7, Sunday-Sunday	Academic holiday

Winter Term 2018

Date	Event
January 8, Monday	Beginning of winter term – classes begin
January 15, Monday	Academic holiday – Martin Luther King, Jr.'s Birthday observed
January 22, Monday	End of second week of instruction
January 29, Monday	End of third week of instruction – Census date

February 19, Monday	Academic holiday – Washington's Birthday observed
February 20, Tuesday	Classes follow a Monday Schedule
February 27, Tuesday	End of seventh week of instruction
March 16, Friday	Last day of classes
March 17, Saturday	Common final exams (optional)
March 19–23, Monday-Friday	Final examination period
March 23, Friday	End of winter term
March 24–April 1, Saturday-Sunday	Academic holiday

Spring Term 2018

Date	Event
April 2, Monday	Beginning of spring term – classes begin
April 13, Friday	End of second week of instruction
April 20, Friday	End of third week of instruction – Census date
May 18, Friday	End of seventh week of instruction
May 28, Monday	Academic holiday – Memorial Day observed
June 8, Friday	Last day of classes
June 9, Saturday	Common final exams (optional)
June 11–15, Monday-Friday	Final examination period
June 16–17, Saturday-Sunday	Commencement; End of spring term; End of university year (faculty only)

For the most current information, see the 2017-18 calendar via the Academic Calendar website (http://registrar.calpoly.edu/content/acad_cal/index).

Summer Term 2018

Date	Event
June 25, Monday	Beginning of university year; Beginning of summer term - classes begin
July 4, Wednesday	Academic holiday – Independence Day observed
July 9, Monday	End of second week of instruction
July 16, Monday	End of third week of instruction – Census date
August 13, Monday	End of seventh week of instruction
August 31, Friday	Last day of classes for 10-week session
September 3, Monday	Academic holiday - Labor Day observed
September 4 - 6, Tuesday-Thursday	Final examination period for 10-week session
September 6, Thursday	End of summer term
September 7-12, Friday-Wednesday	Academic holiday

Fall Term 2018

Date	Event
September 13, Thursday	Beginning of fall term (faculty only)
September 20, Thursday	Fall term classes begin

October 3, Wednesday	End of second week of instruction
October 10, Wednesday	End of third week of instruction – Census date
November 7, Wednesday	End of seventh week of instruction
November 12, Monday	Academic holiday – Veterans' Day observed
November 19-25, Monday-Sunday	Academic holiday – Thanksgiving
December 7, Friday	Last day of classes
December 8, Saturday	Common final exams (optional)
December 10-14, Monday-Friday	Final examination period
December 15, Saturday	Mid-Year Commencement, End of fall term
December 16– January 6, Sunday-Sunday	Academic holiday

For most current information, see the 2018-19 calendar via the Academic Calendar website (https://registrar.calpoly.edu/Calendars_Deadlines).

Winter Term 2019

Date	Event
January 7, Monday	Beginning of winter term – classes begin
January 18, Friday	End of second week of instruction
January 21, Monday	Academic holiday – Martin Luther King, Jr.'s Birthday observed
January 28, Monday	End of third week of instruction - Census date
February 18, Monday	Academic holiday – Washington's Birthday observed
February 19, Tuesday	Classes follow a Monday schedule
February 26, Tuesday	End of seventh week of instruction
March 15, Friday	Last day of classes
March 16, Saturday	Common final exams (optional)
March 18-22, Monday-Friday	Final examination period
March 25, Monday	Evaluation Day (faculty workday; no classes), End of winter term
March 26 - April 1, Tuesday-Monday	Academic holiday

Spring Term 2019

Date	Event
April 2, Tuesday	Beginning of spring term – classes begin
April 15, Monday	End of second week of instruction
April 22, Monday	End of third week of instruction – Census date
May 20, Monday	End of seventh week of instruction
May 27, Monday	Academic holiday – Memorial Day observed
May 28, Tuesday	Classes follow a Monday schedule
June 7, Friday	Last day of classes
June 8, Saturday	Common final exams (optional)
June 10-14, Monday-Friday	Final examination period
June 15-16, Saturday-Sunday	Commencement; End of spring term; End of university year (faculty only)

ADMISSIONS

Undergraduate

Office of Admissions, Recruitment & Financial Aid
Administration Building (01), Room 206
Phone: 805.756.2311; Fax: 805.756.5400
Tour Information Line: 805.756.5734
Email: admissions@calpoly.edu
admissions.calpoly.edu/

Admissions

Cal Poly comprehensively reviews all applications, seeking students who have strong academic records and are active in and outside the classroom. Admission to Cal Poly is highly competitive. Beyond the basic California State University qualifications, Cal Poly considers other factors for admission deemed important to the campus and does so in an objective format. Review the selection criteria for undergraduate applicants by starting here: <http://admissions.calpoly.edu/prospective/criteria.html>.

Applicants are notified of a formal decision by April 1.

First-Time Freshman Factors

When a freshman application is reviewed, the following are considered:

- The applicant's intended program of study (the major to which application is made)
- The applicant's college preparatory courses in secondary school
- GPA earned in college preparatory courses
- Standardized test scores
- The applicant's extra-curricular activities and work experience

For a comprehensive look at Cal Poly's selection criteria for a freshman applicant, including deadlines, visit <http://admissions.calpoly.edu/applicants/freshman/>.

Upper-Division Transfer Factors

When an upper-division¹ transfer application is reviewed, the following are considered:

- The applicant's intended program of study (the major to which application is made)
- The number of units completed
- Completion of CSU and Cal Poly program required coursework with a grade of 'C' or better
- General Education (G.E. Breadth) or Intersegmental General Education Transfer Curriculum (IGETC) courses
- Academic performance in college courses (GPA)
- The applicant's extracurricular activities and work experience

For a comprehensive look at Cal Poly's selection criteria for a transfer applicant, including deadlines, visit <http://admissions.calpoly.edu/applicants/transfer/>.

The majors below have additional requirements:

- Art and Design – qualified freshman and transfer applicants will be requested to submit an electronic portfolio per specific instructions provided to the applicant
- Music – qualified freshman and transfer applicants will be requested to audition either in person or via specified media
- Architecture – qualified transfer applicants will be requested to submit a portfolio per specific instructions provided to the applicant

- ¹ Cal Poly only considers transfer applicants at the junior level (60 or more transferable semester units or 90 quarter units by the time of transfer [end of previous spring term for Fall admission]). Cal Poly *does not* accept applications for these categories:
- Lower-division transfer applicants (less than 60 transferable semester units or 90 transferable quarter units upon transfer)
 - Students seeking a second baccalaureate degree
 - Students seeking professional growth or professional development

Appeals to Undergraduate Admission Decisions - Freshmen and Transfers

Cal Poly does not set aside spaces for students who appeal admission decisions. Every denied application has been reviewed for maximum consideration. Therefore, for an appeal to have merit it must bring to light new academic information, as well as information pertaining to extenuating circumstances that was not present in the application information that clearly shows the student to be stronger than had been earlier evidenced. Neither grades received in the current academic year nor mistakes made by the applicant on the application are a basis for an appeal or the reversal of a decision.

Review the Cal Poly Admissions website for complete information and instructions regarding the process to submit an appeal at <https://admissions.calpoly.edu/applicants/notselected.html>.

Application Procedures

For admission consideration, Cal Poly requires applicants to submit the online application (www.calstate.edu/apply (<http://www.calstate.edu/apply>)) with the corresponding \$55.00 application fee, which is both non-refundable and non-transferable. The application and fee cannot be used to apply to another term.

Applicants should not submit additional information beyond the information submitted on the application unless requested to do so by the Admissions Office. Applicants are advised to submit complete and accurate information on the application for admission. Failure to file complete, accurate, and authentic application documentation may result in denial of admission, cancellation of academic credit, suspension, or expulsion (Section 41301 of Title V, California Code of Regulations).

View detailed online application information at <https://admissions.calpoly.edu/applicants>.

Cal Poly Application Filing Periods

Cal Poly accepts undergraduate (freshman or transfer) applications for the Fall term only.

Freshman Applicants apply through the online process. This process requires applicants to submit Cal Poly's online application with the corresponding fee during the application filing period of October 1 to November 30.

*Please note: Applicants will receive notification of their admission status by April 1. Those selected must accept or decline Cal Poly's offer of admission by May 1

Transfer Applicants apply through the online process. This process requires applicants to submit Cal Poly's online application with the corresponding fee during the application filing period of October 1 to November 30.

*Please note: Applicants will receive notification of their admission status by April 1. Those selected must accept or decline Cal Poly's offer of admission by May 1.

Offers of admission to Cal Poly are conditional pending satisfactory compliance with the "Terms and Conditions of Admission" found online at <http://admissions.calpoly.edu/admitted/terms>.

The California Promise Program

The California Promise Program enables a specific number of campuses of the California State University (CSU) to establish pledge programs for entering first-time students who are both interested and able to complete baccalaureate degrees in four years. Many campuses have also established programs for students with Associate Degrees for Transfer from any California Community College to complete their baccalaureate degrees in two years. The program is limited to students who are residents of California.

Students who commit to enter either the four-year or two-year pledge will be given a priority registration appointment for each state-supported enrollment period and will be provided with routine and thorough academic advisement.

Senate Bill No. 412, which establishes the California Promise program, specifies that "a student shall not receive priority registration in coursework under the program if he or she qualifies for priority registration under another policy or program, as determined by the campus." At Cal Poly, priority registration is determined by a student's academic progress level, i.e. percentage of completed degree-applicable units.

In order to remain in the program, students must meet with their advisors as prescribed, develop an enrollment plan, and complete 45 degree applicable quarter units within each academic year, including summer. Participating campuses may stipulate other important requirements as well. Interested students entering Cal Poly in the Fall 2017 term should contact the California Promise advisor, Gina Salazar, in the Mustang Success Center (glsalaza@calpoly.edu) or visit the CSU's California Promise webpage.

The California Promise at Cal Poly

Cal Poly has established a pilot pledge program for students with Associate Degrees for Transfer to complete their baccalaureate degrees in two years. The Bachelor of Arts in English is the only major available at this time. Interested students should also visit Cal Poly's California Promise (<https://academicprograms.calpoly.edu/california-promise-program-cal-poly>) webpage.

Former/Returning Students

Former Students Returning in the Same Major

Students who were previously enrolled at Cal Poly and who wish to return to the university must follow the guidelines appropriate to their category.

Former undergraduate students who left Cal Poly in **good standing (2.0 or higher GPA)**, before completing their degree, and who wish to resume their former program (major) at Cal Poly, can essentially be reinstated after submitting a paper CSU undergraduate application and transcripts from any institutions attended after leaving Cal Poly. A returning student is one who has no enrollment record for three consecutive regular terms (fall, winter, spring). If you have missed 2 terms, you may enroll without completing a returning student application. Once you have missed 3 terms, you must complete a returning student application. A CSU paper application and corresponding fee is filed or postmarked before the application deadline date listed below for the appropriate term:

Term	Deadline
Fall Quarter	July 1st
Winter Quarter	October 1st
Spring Quarter	February 1st

Former students **who did not leave the university in good standing** (i.e., were academically disqualified), will have their application and transcripts sent to their department college for review before reinstatement can occur. Applicants in this category are advised to contact their major's academic department or advising center to begin dialogue about satisfying any requirements **before** submitting their application.

Former Students Returning in a New Major

Former Cal Poly students wishing to return to Cal Poly in a different major must file an online application with the corresponding fee by the same application deadline as new applicants. Applicants in this category will compete equally with new applicants for the available transfer openings in their declared major.

Other Information

Consistency with State Regulations

The philosophy of the Cal Poly Admissions Office is consonant with the mission of California Polytechnic State University and is in accordance with Title V, Chapter 1, Subchapter 3, of the California Code of Regulations, and specifically, the California Code of Regulations for the California State University System, Title V, Section 40600.

Graduate Admission Requirements

View online information for graduate admission at <http://admissions.calpoly.edu/applicants/graduate/>.

Determination of Residence for Tuition Purposes

The Cal Poly Admissions Office determines the residence status of all new and returning students for tuition purposes. View comprehensive online information at <http://admissions.calpoly.edu/applicants/mycalpoly/resinfo.html>.

International Students

Office of Admissions, Recruitment & Financial Aid
Administration Building (01), Room 206
Phone: 805.756.2311; Fax: 805.756.5400
Tour Information Line: 805.756.5734
admissions.calpoly.edu/
Email: admissions@calpoly.edu

International Admissions

Cal Poly, as part of the California State University (CSU) system, assesses the academic preparation of international students using factors such as academic performance, verification of English proficiency, and financial resources (to meet federal regulations). For this purpose, international students include those who hold U.S. visas as students, exchange visitors, or those in other nonimmigrant classifications. The CSU uses separate requirements and application filing dates in the admission of international students.

Reference the International Admissions section on the Cal Poly Admissions website for detailed information, at <http://admissions.calpoly.edu/applicants/international/>.

Application Procedures

Cal Poly does not have a separate international application. International applicants submit the online application (www.calstate.edu/apply) appropriate to their level of entry with the corresponding \$55.00 application fee which is both non-refundable and non-transferable. The Cal Poly Admissions Office will contact each international applicant regarding additional requirements once the application has been received. View application information, deadlines and selection timelines by visiting <http://admissions.calpoly.edu/applicants/international/deadlines.html>.

For more information about international admission in addition to the application for admission requirements:

International Freshman Applicants – visit <http://admissions.calpoly.edu/applicants/international/checklist.html>.

International Transfer Applicants – visit <http://admissions.calpoly.edu/applicants/international/checklist.html>.

Please note: Cal Poly does not accept applications for undergraduate transfer students with less than 60 transferable semester units (90 quarter units) or applications for second undergraduate degrees.

International Graduate Applicants – visit <http://admissions.calpoly.edu/applicants/international/checklist.html>.

After all required documents have been received, the Admissions Office will determine eligibility for admission and will notify the applicant of the result. International applicants admitted to Cal Poly will complete a visa questionnaire and receive a Certificate of Eligibility for Nonimmigrant Student Status (I-20 form) which is necessary to obtain a student visa to enter the United States or for requesting permission from the U.S. Citizenship and Immigration Services (USCIS) for transfer to Cal Poly from another U.S. institution. Other requirements may be imposed by USCIS. Applicants should note the I-20 form is valid for enrollment only at Cal Poly for the term indicated and that it includes an expiration date.

Deadlines

Undergraduate Deadlines for International Students

Term	Application Filing Period	File Completion Deadline
Fall only	Oct 1- Nov 30	March 1

Graduate Deadlines for International Students

Term	Application Filing Period	File Completion Deadline
Fall only	Application deadline is the same as the program deadline or April 1st, whichever date is earlier	File completion deadline is the same as the program deadline or May 1st, whichever date is earlier

For detailed information about deadlines, visit <http://admissions.calpoly.edu/applicants/international/deadlines.html>.

International students should also visit the Cal Poly International Center website at <http://international.calpoly.edu/index.html> for additional international student information and services.

FINANCIAL INFORMATION

Fees and Expenses

<http://afd.calpoly.edu/fees/>

The CSU makes every effort to keep student costs to a minimum. Tuition and fees listed in published schedules or student accounts may need to be increased when public funding is inadequate. Therefore, CSU reserves the right, even after tuition or fees are initially charged or initial payments are made, to increase or modify any listed tuition or fees. All listed fees, other than mandatory systemwide tuition, are subject to change without notice, until the date when instruction for a particular semester or quarter has begun. All CSU listed tuition and fees should be regarded as **estimates** that are subject to change upon approval by the Board of Trustees, the Chancellor, or the Presidents, as appropriate. Changes in mandatory systemwide tuition will be made in accordance with the requirements of the Working Families Student Fee Transparency and Accountability Act (Sections 66028 - 66028.6 of the Education Code).

The following reflects applicable systemwide tuition and fees for both semester and quarter campuses that were authorized by the Board of Trustees at the March 2017 meeting. These rates are subject to change.

All Students

Application Fee (nonrefundable), payable online at the time of application via credit card, e-check or PayPal: \$55

2017/18 Basic Tuition Fees

Units	Per Quarter
Undergraduate Tuition Fee	
6.1 or more	\$1,914
0 to 6.0	\$1,110
Credential Program Tuition Fee	
6.1 or more	\$2,220
0 to 6.0	\$1,288
Graduate/Post Baccalaureate Tuition Fee	
6.1 or more	\$2,392
0 to 6.0	\$1,388

2017/18 Doctorate Tuition Fees*

	Units	Per Quarter	Per Academic Year
Education	All Students	\$3,946	\$11,838
Nursing Practice	All Students		\$15,270
Physical Therapy	All Students		\$17,196

*Applicable term tuition applies for campuses with special terms, as determined by the campus. Total college year tuition cannot exceed the academic year plus summer term tuition. The summer term tuition for the education doctorate at quarter campuses is equal to the per semester tuition listed in the table. Total tuition for the education doctorate over the college year equals the per academic year tuition plus the per semester tuition for the summer term at all CSU campuses.

2017/18 Graduate Professional Program Fee

	Quarter
Charge Per Unit	\$180

The graduate business professional fee is paid on a per unit basis in addition to basic tuition and campus fees for the following graduate business programs:

- Master of Business Administration (M.B.A.)

Nonresident Students (U.S. and Foreign)

Nonresident Tuition (in addition to basic tuition and other systemwide fees charged all students) for all campuses:

	Quarter
Charge Per Unit	\$264

The total nonresident tuition paid per term will be determined by the number of units taken.

Mandatory systemwide tuition is waived for those individuals who qualify for such exemption under the provisions of the California Education Code (see section on fee waivers).

Students are charged campus fees in addition to tuition and systemwide fees. Information on campus fees can be found by contacting the individual campus(es).

Credit Cards:

Visa, MasterCard, American Express and Discover credit cards may be used for payment of student tuition and fees but may be subject to a non-refundable credit card processing fee.

SCHEDULE OF TUITION AND FEES 2018/19

The CSU makes every effort to keep student costs to a minimum. Tuition and fees listed in published schedules or student accounts may need to be increased when public funding is inadequate. Therefore, CSU reserves the right, even after initial payments are made, to increase or modify any listed tuition or fees. All listed fees, other than mandatory systemwide tuition are subject to change without notice, until the date when instruction for a particular semester or quarter has begun. All CSU listed tuition and fees should be regarded as **estimates** that are subject to change upon approval by the Board of Trustees, the Chancellor, or the Presidents, as appropriate. Changes in mandatory systemwide tuition will be made in accordance with the requirements of the Working Families Student Fee Transparency and Accountability Act (Sections 66028 - 66028.6 of the Education Code).

The following reflects applicable systemwide tuition and fees for both semester and quarter campuses. **These rates are subject to change.**

All Students

Application Fee (nonrefundable), payable online at the time of application via credit card, e-check or PayPal: \$55

2018/19 Basic Tuition Fees

Units	Per Quarter
Undergraduate Tuition Fee	
6.1 or more	\$1,914
0 to 6.0	\$1,110
Credential Program Tuition Fee	

6.1 or more	\$2,220
-------------	---------

0 to 6.0	\$1,288
----------	---------

Graduate/Post Baccalaureate Tuition Fee

6.1 or more	\$2,392
-------------	---------

0 to 6.0	\$1,388
----------	---------

2018/19 Doctorate Tuition Fees*

	Units	Per Quarter	Per Academic Year
Education	All Students	\$3,946	\$11,838
Nursing Practice	All Students		\$15,270
Physical Therapy	All Students		\$17,196

*Applicable term tuition applies for campuses with special terms, as determined by the campus. Total college year tuition cannot exceed the academic year plus summer term tuition. The summer term tuition for the education doctorate at quarter campuses is equal to the per semester tuition listed in the table. Total tuition for the education doctorate over the college year equals the per academic year tuition plus the per semester tuition for the summer term at all CSU campuses.

2018/19 Graduate Professional Program Fee

	Quarter
Charge Per Unit	\$180

The graduate business professional fee is paid on a per unit basis in addition to basic tuition and campus fees for the following graduate business programs:

- Master of Business Administration (M.B.A.)

Nonresident Students (U.S. and Foreign)

Nonresident Tuition (in addition to basic tuition and systemwide fees charged all students) for all campuses:

	Quarter
Charge Per Unit	\$264

The total nonresident tuition paid per term will be determined by the number of units taken.

Mandatory systemwide tuition is waived for those individuals who qualify for such exemption under the provisions of the California Education Code (see section on fee waivers).

Students are charged campus fees in addition to tuition and systemwide fees. Information on campus fees can be found by contacting the individual campus(es).

Credit Cards:

Visa, MasterCard, American Express and Discover credit cards may be used for payment of student tuition and fees but may be subject to a non-refundable credit card processing fee.

Schedule of Fees

Please refer to <http://afd.calpoly.edu/fees/> for complete information on fees, including on-campus housing, meal costs, and parking fees.

All regularly enrolled students, both undergraduate and graduate, pay registration and tuition fees determined by the number of units per quarter. In addition to registration and basic tuition fees, nonresident and foreign students pay nonresident tuition fees. Mandatory system-wide tuition and other fees are waived for those individuals who qualify for such exemption under the provisions of the California Education Code (see Student Fee Waivers).

Registration and Tuition Fees Per Quarter

Registration and Tuition Fees are the sum of two types of fees:

1. Campus-Wide Fees that are payable irrespective of college, and
2. Campus Academic Fees, which vary by college/academic unit.
Campus-wide fees include: basic Tuition Fee, Associated Students Fee, Health Facilities Fee, Instructionally Related Activities Fee, Health Services Fee, University Union Fee, and Campus Services Card Fee. Nonresident and foreign students are also charged per unit the nonresident tuition fee.

Cal Poly registration and tuition fees are due at the time of registration, and all prior term balances must be paid in full in order to register. Fees that are not paid by the third day following a student's registration become past due, and a registration hold is placed on the account that prevents adding or swapping classes. If registration and tuition fees are still past due as of the next published cancellation date, then the student may be canceled from all enrolled classes. Students who have accepted financial aid, have an approved third-party contract on file, or are receiving fee waivers are not subject to class cancellation or financial registration holds until the quarter's first financial aid disbursement date. Financial aid students whose awards are insufficient to pay fees in full are billed for the balance, and are unable to register for subsequent quarters until the balance has been paid.

Refund of Tuition and Mandatory Fees, Including Nonresident Tuition

Regulations governing the refund of tuition and mandatory fees, including nonresident tuition, for students enrolling at the California State University are included in §41802 of Title 5, California Code of Regulations. For purposes of the refund policy, mandatory fees are defined as those system-wide and campus fees that are required to be paid in order to enroll in state-supported academic programs at the CSU. Refunds of fees and tuition charges for self-support, special session, and extended education programs or courses at the CSU are governed by a separate policy established by the University available at <http://www.extended.calpoly.edu/faq/policies.html#>

In order to receive a full refund of tuition and mandatory fees, less an administrative charge established by the campus, including nonresident tuition, a student must cancel registration or drop all courses prior to the first day of instruction for the term. Information on procedures and deadlines for canceling registration and dropping classes is available online at <https://registrar.calpoly.edu/>.

For state-supported semesters, quarters, and non-standard terms or courses of four (4) weeks or more, a student who withdraws during the term in accordance with the University's established procedures or drops all courses prior to the campus-designated drop period will receive a refund of tuition and mandatory fees, including nonresident tuition, based on the portion of the term during which the student was enrolled. No

student withdrawing after the 60 percent point in the term is entitled to a refund of any mandatory fees or nonresident tuition.

A student who, within the campus designated drop period and in accordance with campus procedures, drops units resulting in a lower tuition and/or mandatory fee obligation shall be entitled to a refund of applicable tuition and mandatory fees less an administrative charge established by the campus.

For state-supported non-standard terms or courses of less than four (4) weeks, no refund of tuition and mandatory fees, including non-resident tuition, will be made unless a student cancels registration or drops all classes, in accordance with the university's established procedures and deadlines, prior to the first day of instruction for state-supported non-standard terms or courses or prior to the first meeting for courses of less than (4) weeks.

Students also receive a refund of tuition and mandatory fees, including nonresident tuition, under the following circumstances:

- The tuition and fees were assessed or collected in error;
- The University canceled the course for which the tuition and fees were assessed or collected;
- The University makes a delayed decision that the student was not eligible to enroll in the term for which tuition and mandatory fees were assessed and collected and the delayed decision was not due to incomplete or inaccurate information provided by the student; or
- The student was activated for compulsory military service.

Students who are not entitled to a refund as described above may petition the University for a refund demonstrating exceptional circumstances and the chief financial officer of the University or designee may authorize a refund if he or she determines that the fees and tuition were not earned by the University. Information concerning any aspect of the refund of fees may be obtained from the Student Accounts Office. Contact information can be found at http://afd.calpoly.edu/student_accounts/.

Fees and Debts Owed to the University

Should a student or former student fail to pay a fee or a debt owed to the institution, including tuition and student charges, the institution may "withhold permission to register, to use facilities for which a fee is authorized to be charged, to receive services, materials, food or merchandise, or any combination of the above from any person owing a debt" until the debt is paid (see Title 5, California Code of Regulations, Sections 42380 and 42381).

Prospective students who register for courses offered by the University are obligated for the payment of charges and fees associated with registration for those courses. Failure to cancel registration in any course for an academic term prior to the first day of the academic term gives rise to an obligation to pay student charges and fees including any tuition for the reservation of space in the course.

The institution may withhold permission to register or to receive official transcripts of grades or other services offered by the institution from anyone owing fees or another debt to the institution. The institution may also report the debt to a credit bureau, offset the amount due against any future state tax refunds due the student, refer the debt to an outside collection agency and/or charge the student actual and reasonable collection costs, including reasonable attorney fees if litigation is necessary, in collecting any amount not paid when due. If a person believes he or she does not owe all or part of an asserted unpaid

obligation, that person may contact the campus business office. The business office, or another office on campus to which the business office may refer the person, will review all pertinent information provided by the person and available to the campus and will advise the person of its conclusions.

Credit Cards

Visa, Master Card, Discover Card, American Express, and JCB may be used for payment of registration and tuition fees, nonresident tuition fees, housing, dining plans and certain other University fees using the web credit card system. The University also accepts electronic check payments, known as eCheck or ACH, using the web on-line payment systems. Details concerning the use of electronic checks and credit cards for fee payments may be obtained from the University website under http://afd.calpoly.edu/Student_Accounts/online_payments.asp. Credit cards may be used for the purchase of theatre and sports events tickets from the Ticket Office or PolyTIX online ticketing website, Bookstore purchases, parking permits and payment of parking citations with University Police, and for Extended Education program fees. Contact the individual service center for specific credit card information.

Fee Waivers and Exemptions

The California Education Code includes provisions for the waiver of mandatory systemwide tuition and other fees as follows:

- § 66025.3 – Dependent eligible to receive assistance under Article 2 of Chapter 4 of Division 4 of the Military and Veterans Code; child of any veteran of the United States military who has a service-connected disability, has been killed in service, or has died of a service-connected disability, and meets specified income provisions; dependent, or surviving spouse who has not remarried, of any member of the California National Guard who, in the line of duty, and while in the active service of the state, was killed, died of a disability resulting from an event that occurred while in the active service of the state, or is permanently disabled as a result of an event that occurred while in the active service of the state; and undergraduate student who is a recipient of a Medal of Honor, or undergraduate student who is a child of a recipient of a Medal of Honor who is no more than 27 years old, meets the income restriction and California residency requirement. The waiver of tuition or fees under this section applies only to a person who is determined to be a resident of California pursuant to Chapter 1 (commencing with Section 68000) of Part 41.
- § 66602 – A qualifying student from the California State University who is appointed by the Governor to serve as Trustee of the California State University for the duration of his or her term of office.
- § 68120 – Surviving spouse or child of a deceased California resident who was employed by a public agency, or was a contractor or an employee of a contractor, performing service for a public agency, and was killed in the performance of his/her principal duties of active law enforcement or fire suppression and prevention duties (referred to as Alan Pattee Scholarships). A person who qualifies for the waiver under this section as a surviving child of a contractor or of an employee of a contractor, who performed services for a public agency must have enrolled as an undergraduate student at the California State University and meets income restriction requirement.
- § 68121 – A qualifying student enrolled in an undergraduate program who is the surviving dependent of any individual killed in the September 11, 2001 terrorist attacks on the World Trade Center in New York City, the Pentagon building in Washington, D.C., or the crash of United Airlines Flight 93 in southwestern Pennsylvania,

if the student meets the financial need requirements set forth in Section 69432.7 for the Cal Grant A Program and either the surviving dependent or the individual killed in the attacks was a resident of California on September 11, 2001. Students who may qualify for the above benefits should contact the Admissions Office for further information and/or an eligibility determination.

The California Education Code provides for the following nonresident tuition exemptions:

- § 68075.7 - A nonresident student is exempt from paying nonresident tuition or any other fee that is exclusively applicable to nonresident students if the student (1) resides in California, (2) meets the definition of "covered individual" as defined in either: (A) Section 3679(c)(2)(A) or (B)(ii)(I) of Title 38 of the United States Code, as that provision read on July 1, 2017; or (B) Section 3679(c)(2)(B)9(i) or (ii) (II) or Title 38 of the United States Code, as that provision read on January 1, 2017; and (3) is eligible for education benefits under either the federal Montgomery GI Bill-Active Duty program or the Post-9/11 GI Bill program as each read on January 1, 2017.
- § 68122 - A student who is a victim of trafficking, domestic violence, and other serious crimes who has been granted T or U visa status shall be exempt from paying nonresident tuition to the same extent as individuals who are admitted to the United States as refugees under Section 1157 of Title 8 of the United States Code.
- § 68130.5 - A student, other than a nonimmigrant alien, who is not a resident of California is exempt from paying nonresident tuition if the student meets the requirements of (1) through (4), below:

(1) Satisfaction of the requirements of either subparagraph (A) or subparagraph (B):

(A) A total attendance of, or attainment of credits earned while in California equivalent to, three or more years of full-time attendance or attainment of credits at any of the following:

- (i) California high schools.
- (ii) California high schools established by the State Board of Education.
- (iii) California adult schools established by a county office of education, a unified school district or high school district, or the Department of Corrections and Rehabilitation (subject to the class hours' requirement).
- (iv) Campuses of the California Community Colleges (subject to the credit requirements).
- (v) A combination of those schools set forth in clauses (i) to (iv), inclusive.

(B) Three or more years of full-time high school coursework, and a total of three or more years of attendance in California elementary schools, California secondary schools, or a combination of California elementary and secondary schools.

(2) Satisfaction of any of the following:

(A) Graduation from a California high school or attainment of the equivalent thereof.

(B) Attainment of an associate degree from a campus of the California Community Colleges.

(C) Fulfillment of the minimum transfer requirements established for the California State University for students transferring from a campus of the California Community Colleges.

(3) Registration as an entering student at, or current enrollment at, an accredited institution of higher education in California not earlier than the fall semester or quarter of the 2001–02 academic year.

(4) In the case of a person without lawful immigration status, the filing of an affidavit with the institution of higher education stating that the student has filed an application to legalize his or her immigration status, or will file an application as soon as he or she is eligible to do so.

Students who may qualify for these benefits should contact the Admissions Office for further information and/or an eligibility determination.

Procedure for the Establishment or Abolishment of Campus-Based Mandatory Fees

The law governing the California State University provides that specific campus fees defined as mandatory, such as a student association fee and a student center fee, may be established. A student association fee must be established upon a favorable vote of two-thirds of the students voting in an election held for this purpose (Education Code, Section 89300). The campus President may adjust the student association fee only after the fee adjustment has been approved by a majority of students voting in a referendum established for that purpose. The required fee shall be subject to referendum at any time upon the presentation of a petition to the campus President containing the signatures of 10 percent of the regularly enrolled students at the University. Student association fees support a variety of cultural and recreational programs, childcare centers, and special student support programs. A student center fee may be established only after a fee referendum is held which approves by a two-thirds favorable vote, the establishment of the fee (Education Code Section 89304). Once bonds are issued, authority to set and adjust student center fees is governed by provisions of the State University Revenue Bond Act of 1947, including, but not limited to, Education Code sections 90012, 90027, and 90068.

The process to establish and adjust other campus-based mandatory fees requires consideration by the campus fee advisory committee and a student referendum as established by Executive Order 1102 (<http://www.calstate.edu/Budget/student-fees/fee-policy/referendum-consultation.shtml>). The campus President may use alternate consultation mechanisms if he/she determines that a referendum is not the best mechanism to achieve appropriate and meaningful consultation. Results of the referendum and the fee committee review are advisory to the campus President. The President may adjust campus-based mandatory fees but must request the Chancellor establish a new mandatory fee. The President shall provide to the fee advisory committee a report of all campus-based mandatory fees. The campus shall report annually to the Chancellor a complete inventory of all campus-based mandatory fees.

For more information or questions, please contact the Budget Office in the CSU Chancellor's Office at 562.951.4560.

Financial Aid

Financial Aid Office
Administration Bldg. (01), Room 212
Phone: 805.756.2927; Fax: 805.756.7243
<http://financialaid.calpoly.edu/>

The University has a variety of scholarships, grants, part-time employment opportunities and loans designed to assist students financially. Additional current information may be obtained by accessing the Financial Aid Office website.

The application for Financial Aid is called the Free Application for Federal Student Aid (FAFSA). The FAFSA is available at www.fafsa.ed.gov (<http://www.fafsa.ed.gov>). Those who file the FAFSA by March 2 receive priority in the allocation of funds. All students are encouraged to file the FAFSA and qualified students are considered for need-based scholarships.

Typical Student Expenses

Following are the average expenses per quarter for the 2017-18 academic year for the California resident student attending Cal Poly. Nonresident and international students should be prepared to pay additional tuition and fees. For the 2017-18 school year nonresident tuition is an additional \$264 per unit. Please see the "Fees and Expenses (p. 23)" section for more information. All State fees are subject to change upon approval by the Board of Trustees of the California State University.

University Estimated Expenses per Quarter

Expense	Price
Registration fees	3,114
Room and board	4,378
Books and supplies	628
Personal and transportation	901
Estimated total per quarter	\$9,021

Cancellation of Registration or Withdrawal from the Institution and Financial Aid

Students who find it necessary to cancel their registration or to withdraw from all classes after enrolling for any academic term *are required* to follow the University's official withdrawal procedures. Failure to follow formal University procedures may result in an obligation to pay fees, the assignment of failing grades in all courses and the need to apply for readmission before being permitted to enroll in another academic term. Information on canceling registration and withdrawal procedures is available from the Office of the Registrar, Administration Building, Room 222, 805.756.2531.

Students who receive financial aid funds *must consult* with the Financial Aid and Student Accounts Offices prior to withdrawing from the University regarding any refunds or repayments of grant or loan assistance received for that academic term or payment period. Students who have received financial aid and withdraw from the institution during the academic term or payment period may need to return or repay some or all of the funds received, which may result in a debt owed to the institution.

University Scholarships

General Information

Scholarships are awarded each year. Criteria include financial need, scholastic achievement, participation in school activities, community service, honors and organizational affiliations, and educational objectives. Some scholarships have additional requirements which relate to a concentration or field of study, geographic origin, class level, and project or design portfolios.

There are numerous scholarships available due to the generous support of individuals and corporations. Please refer to the Financial Aid web site for detailed information.

Generally, a student must have at least a 3.0 grade point average. Both undergraduate and graduate students enrolled full time in the spring term are considered for scholarships.

Annual Deadline Date to Apply: *Incoming students are automatically considered for scholarships. Continuing students should check with their department for any departmental deadlines.*

How to Apply

The Financial Aid Office website offers the latest information at financialaid.calpoly.edu/. For need-based scholarships, completing the FAFSA is required.

Scholarship Notifications

Scholarships are normally awarded during the spring and summer for the following academic year. During that time award offer notices are emailed directing the student to the self-service portal to view financial aid awards which include scholarship amount, disbursement and donor information. Awardees must accept on-line scholarship offers acknowledging program responsibilities and requirements. Recipients must be in good academic standing and maintain full-time enrollment while receiving a scholarship (continuing education and Open University units are excluded). Some scholarships require recipients to have earned at least one-half the value of the scholarship during the previous year.

Scholarships are awarded for an academic year and are typically disbursed in quarterly increments. Non-attendance results in cancellation or a prorated amount.

Athletic Program Grants-In-Aid

Cal Poly athletic grants-in-aid are offered to selected students participating in intercollegiate athletics. Grants are renewable on a quarterly basis, the requisites for renewal being at the discretion of the University.

The grant-in-aid is subject to the financial limitations imposed by the National Collegiate Athletic Association and any conference of which the University is a member. Financial aid, scholarships, specific outside resources and employment are considered in determining compliance with these limitations. Additional information can be provided by the Athletic Department.

Other Scholarships

In addition to University scholarships, awards from various private donors and organizations are available to assist students with University expenses. Interested students should make inquiries for such awards directly to sponsoring organizations. Currently, Cal Poly students are beneficiaries of several million dollars of outside scholarship assistance each year. Students should take advantage of FREE scholarship search

services; many who charge are selling information that is readily available at no cost. Other sources of scholarship funding may be available from:

- community organizations
- employers
- professional, career and trade associations

For valuable links visit the scholarship website at http://financialaid.calpoly.edu/_finaid/types_aid/scholarships.htm.

Grants

Federal Pell Grants are designed to help undergraduates and teaching credential candidates pay for their education. The Pell Grant amount is determined by the Expected Family Contribution, the cost of education, full-time or part-time enrollment and terms of enrollment. To apply, complete the FAFSA for the upcoming year.

Federal TEACH Grants are available to students who commit to four years of teaching in a high need area (science, mathematics, special education, and, in California, agriculture) in a school serving low income families. The grant converts to a federal unsubsidized loan if the teaching commitment is not met. To apply, complete the FAFSA for the upcoming year and contact the financial aid office.

Federal Supplemental Educational Opportunity Grant (SEOG) is designed to assist undergraduate students who have substantial financial need. To apply, complete the FAFSA by **March 2** for the upcoming school year.

Cal Grants

The California Student Aid Commission (CSAC) awards entitlement and competitive Cal Grants. To qualify, students must be California residents or eligible under AB 540. If applying for a Cal Grant for the first time, students must complete the FAFSA and a Cal Grant GPA verification form. Request the GPA Verification Form from your high school or college. To apply, complete the FAFSA and mail the GPA Verification Form to CSAC by **March 2**.

For the latest information on the Cal Grant program, visit the CSAC website at www.csac.ca.gov (<http://www.csac.ca.gov>).

Cal Grant A is awarded to middle- and low-income undergraduates. New awards are limited to students who are freshmen, sophomores or juniors. Cal Grant A covers a portion of student registration fees and eligibility is tied to a family's incoming and assets as reported on the FASFA. Cal Grant A may be renewed until completion of four years of college attendance. Recipients must continue to meet eligibility standards. Students may be eligible for an additional year of Cal Grant A at Cal Poly if enrolled in a designated five-year program or the teaching credential program.

Cal Grant B is awarded to low-income undergraduate students. First year recipients receive stipend only. Cal Grant B renewal recipients receive stipend plus a portion of registration fees. Eligibility is tied to a family's incoming and assets as reported on the FASFA. Cal Grant B may be renewed until completion of four years of college attendance and students must meet eligibility standards. Students may be eligible for an additional year of Cal Grant B at Cal Poly if enrolled in a designated five-year program or the teaching credential program.

State Educational Opportunity Program Grant (SEOP) assists undergraduate students who have been admitted to the University

through the Educational Opportunity Program (EOP). To apply, complete the FAFSA by **March 2** for the upcoming school year.

State University Grant (SUG) covers a portion of student registration fees. SUG is available to undergraduate and graduate students who are California residents or eligible under AB 540 and show financial need. To apply, complete the FAFSA by **March 2** for the upcoming year. The SUG and the Cal Grant pay the same portion of registration fees. Students can receive only one or the other, not both.

Employment

Federal Work-Study (FWS) is a need-based program which provides part-time employment for students. Work-Study jobs assist students financially and may provide career related work experience. FWS positions are either on- or off-campus with approved departments/organizations. Pay rates vary depending on job requirements and student skills. To receive priority consideration, complete the FAFSA by **March 2** for the upcoming school year.

Loans

Loans are for educational purposes only, with specific provisions for repayment. There are three types: Federal Direct Student Loans (FDSL), Federal Parent Loans (PLUS), and on a very limited basis, Cal Poly Long-Term Educational Loans.

Federal Subsidized Direct Loans are available to students through the U.S. Department of Education. Annual amounts are based on the students' need as determined by the FAFSA and federal limits. The federal government pays the interest on the loan while the student is in school and there are deferment provisions. To apply, complete the FAFSA for the upcoming year.

Federal Unsubsidized Direct Loans are available for students who are ineligible for some or all of a subsidized Federal Direct Loan. With the exception of demonstrated financial need, borrowers must meet all eligibility criteria under the Federal Direct Loan program. Interest payments begin immediately after the loan is disbursed or the borrower may elect to defer payment and add the interest to the amount owed. An additional amount of Unsubsidized Direct Loan, above the Federal Subsidized Direct limit, may be available to independent students and to dependent students whose parents are denied a PLUS Loan.

Federal Parent Loans (PLUS) enable borrowers to obtain low interest loans for educational costs through the U.S. Department of Education. PLUS loan repayment begins when the loan is disbursed. To apply, complete the FAFSA.

University Long-Term Educational Loans are available to students who demonstrate long-term financial need. Some require written application, recommendations and interviews. The interest rate is four percent on the unpaid balance during repayment. Typically, interest accrues after the specified due date, graduation or withdrawal from the University. A one percent service charge is deducted from each loan disbursement.

University Short-Term Emergency Loans are designed to help students cope with unanticipated, educationally-related financial emergencies. Registration fees, rent, or utility bills are expenses that students should plan and are not considered emergencies as defined under this program. Full-time enrollment and a minimum 2.0 GPA are required. Each application is reviewed on a case-by-case basis. For further information, visit the Financial Aid Office website at <http://financialaid.calpoly.edu/>

[_finaid/types_aid/special_programs/emergency.html](#), or stop by the office.

GENERAL REQUIREMENTS – BACHELOR'S DEGREE

General Graduation Requirements

There are eight general requirements which all students must meet in order to earn the bachelor's degree from Cal Poly and participate in commencement. The more students understand their progress toward meeting these requirements and relate them to the many programs available, the better the chance of creating an exciting educational experience and avoiding errors which may delay graduation.

Students must be formally admitted to the major in which they wish to graduate, and must matriculate, in order to earn a degree.

The specific requirements for each degree program are shown under the academic department offering the major and include a curriculum display with courses listed by Major, Support, Concentration (if applicable), General Education, and Free Electives. Each major has a degree flow chart, which shows the recommended sequence of courses leading to the degree; see the "Degree Flowcharts" link at the top of this page.

Students are responsible for meeting all requirements, and should embrace the responsibility. Advice is available from faculty advisors, college advising centers, the Office of the Registrar, and students' online Degree Progress Reports. Students should plan their degree programs carefully and review them frequently with their advisors. Students are strongly encouraged to access their Degree Progress Report frequently, including after they register each quarter, to verify that courses in which they enrolled are fulfilling requirements as expected. They are also encouraged to address any unanticipated deficiencies in the information shown on their Degree Progress Report, while realizing that recently received substitutions, transfer credit, etc., may not yet be reflected in the Degree Progress Report. As they approach graduation, careful attention to the Degree Progress Report will help ensure that they complete degree requirements in a timely fashion.

Minimum Requirements for Graduation

1. Minimum Number of Units

Baccalaureate degree programs Minimum 180 units
Individual baccalaureate degree programs may require more than 180 units. (Title 5, Sections 40500, 40501, 40505, 40507) A minimum of 60 units overall must be upper division (defined as any course completed by the student at the 300- or 400-level; this could include transfer work completed at the upper-division level at a four-year institution).

Degree	Minimum # of major units at 300-400 level
Bachelor of Arts (BA)	18
Bachelor of Science (BS)	27
Bachelor of Fine Arts (BFA)	27
Bachelor of Architecture (BArch)	41
Bachelor of Landscape Architecture (BLA)	41

2. Grade Point Average (GPA)

Students must earn at least a 2.000 GPA in all three of the following: 1) all Higher Education units earned (all college-level work), 2) Cal Poly cumulative units earned, and 3) the major (the courses used to meet Major Courses, see the curriculum sheet; support courses

do not count toward major GPA). For a definition of GPA and quality points and hours, please refer to the Grading section of this catalog.

3. U. S. Cultural Pluralism (USCP) Requirement

Students must complete the USCP requirement. See the separate section on USCP.

4. General Education (GE) Requirements

Students must complete the GE requirements as indicated in the degree program and shown in the GE section of this catalog. A CSU-mandated minimum of 72 units of GE overall must be completed.

5. Graduation Writing Requirement (GWR)

Students must demonstrate competency in writing skills (as described below).

6. Senior Project

A senior project is required for all Cal Poly students (as described below).

7. Academic Residence Requirements

The minimum requirements for units taken in residence at Cal Poly are:

- 50 quarter units
- 36 of the 50 units in residence must be upper division
- 18 of the 36 upper division units in residence must be in the major
- 12 units of General Education
- 28 units in residence of the last 40 units counted toward the degree

Extension credit or credit by examination may not be used to fulfill the residence requirements. However, a maximum of 36 quarter units of extension credit may be counted toward the bachelor's degree.

8. Graduation Application Process

When undergraduate students reach 72% or more of degree completion (78% for Architecture and Landscape Architecture majors) as indicated on their Academic Progress gauge on Poly Profile, the Office of the Registrar will assign an expected graduation term for them that is the greater of either: one year away or four years from their first admit term (five years for students in Architecture and Landscape Architecture). Transfer students will be given no less than three years from their admit term. This process occurs each quarter except summer.

Students will receive an email from evaluations@calpoly.edu, informing them that their graduation term has been set for them, and that they are expected to graduate by that term.

The expected graduation term can be viewed in the Student Center and Poly Profile.

Students are not able to register beyond their expected graduation term.

However, there may be legitimate reasons why some students need to extend their graduation term beyond the one that is automatically set for them.

Students with such academically or personally justifiable reasons to extend their graduation term can fill out the Change of Degree Completion Term form and see their advisor for possible approval of the request to extend. The form can be found at: https://registrar.calpoly.edu/registrar_forms.

This form should also be used by students who wish to move their graduation term earlier than the one assigned for them by the university.

Once notified that their graduation term has been set, students should access their Degree Progress Report each time they register, to ensure that they are fulfilling the requirements for their degree.

Students are encouraged to submit any and all paperwork (substitutions, transcripts for requirements completed elsewhere, etc.) in a timely fashion in order to expedite conferral of degrees.

If a student breaks enrollment prior to completion of degree requirements, she or he may be required to re-enroll and may be held to catalog requirements in effect at that time.

Final Degree Conferral

When undergraduate students reach 72% or more of degree completion, as indicated on their Academic Progress Gauge on Poly Profile, the Office of the Registrar will assign an expected graduation term for them that is a full four years after their initial admit term, or one year away, whichever is greater. Transfer students will be given an expected graduation term that is three years after their initial admit term. Students will receive an email from the Evaluations Office informing them that their expected graduation term has been set for. The expected graduation term can be viewed in the Student Center and Poly Profile.

Graduate (Master's) students must submit a [Graduate Application for Graduation](#) Form to the Graduate Education Office at least two quarters prior to the anticipated term of degree completion.

The actual date of graduation (degree conferral) is the end of the quarter in which all requirements have been met. This date may differ from the student's last quarter of enrollment (for example, a student who completes the Graduation Writing Requirement [GWR] or submits Senior Project for final grading after the last term of enrollment).

Graduating students receive one complimentary diploma. Additional diplomas may be ordered through The University Store. The diploma is not ordered until all degree requirements have been completed. The diploma is mailed to the student's mailing address by the Evaluations Unit in the Office of the Registrar approximately three to four weeks after the degree has been conferred. It is the student's responsibility to update her/his mailing address on the Cal Poly Portal (<https://myportal.calpoly.edu>) portal prior to the end of the final quarter of enrollment, to ensure the receipt of their diploma.

Concentrations and minors are not noted on the diploma; they are noted on the transcript. Latin honors are noted on both the diploma and the transcript; the Distinction notation for Master's students is noted on both the diploma and the transcript.

Once a degree has been awarded, subsequent revision or alteration of any transcript entry is permitted only for correction of proven error as certified by the appropriate academic dean and the Registrar. No changes are made to the academic record 60 days following the degree conferral date.

Commencement

For a student to participate in graduation ceremonies, the student must satisfy *at least one* of the following:

- shall have completed all degree requirements and not have participated in a graduation ceremony previously;
- shall currently be enrolled in classes that would complete all of that student's degree requirements;
- shall be registered for classes for the following term that would allow the student to complete all of her/his degree requirements.

Students completing all degree requirements in the Winter, Spring or Summer terms, are automatically eligible to participate in the Spring (June) Commencement. Students completing all degree requirements in the Fall term are eligible for Fall (December) Commencement. Graduate (Masters) students must submit a Request for Graduation Evaluation Form to the Graduate Education Office at least two quarters prior to the anticipated term of degree completion.

Commencement ceremonies are coordinated by the Commencement Office, in collaboration with the Office of the Vice President for Student Affairs and University's Commencement Operations and Policy Committees, and are held twice annually in June and December. See <http://www.commencement.calpoly.edu>.

Graduation Writing Requirement (GWR)

The Board of Trustees of the California State University (CSU) has mandated that all students earning undergraduate or graduate degrees in the CSU must be certified as proficient in writing at the upper-division level.

Students earning a degree from Cal Poly must satisfy the Graduation Writing Requirement (GWR) at Cal Poly. Upper-division transfer students who completed the requirement at another CSU campus prior to enrollment at Cal Poly may transfer completion of the requirement. For more information visit <http://www.writingcenter.calpoly.edu/content/gwr/index>.

Students are eligible to complete the GWR after reaching 90 units and should complete the requirement before the senior year. Students should review their program requirements to determine which of the following options is the appropriate pathway for GWR completion:

1. Pass the Writing Proficiency Exam (WPE).
2. Pass an approved upper-division course with a grade of C or better (**C- or below does not qualify**) AND receive certification of proficiency in writing based on a 500-word in-class essay. The course may be taken on a credit/no credit basis, but the student must earn a minimum grade of C in order to satisfy the GWR component of the class.

Click here (<http://www.writingcenter.calpoly.edu/content/gwr-approved-upper-division-courses>) for a complete list of approved GWR certification courses.

Further information on currently available ways to meet this graduation requirement may be obtained from the Writing & Rhetoric Center Office, Agriculture Building (10) Room 130 (805-756-2067), or on the Writing & Rhetoric Center webpage, <http://www.writingcenter.calpoly.edu/>.

Non-GE writing courses:

ENGL 302	Writing: Advanced Composition
ENGL 310	Corporate Communication
ENGL 317	Technical Editing

GE C4 literature courses:

ENGL 330	British Literature in the Age of Belief: to 1485
ENGL 331	British Literature in the Age of Discovery: 1485-1660
ENGL 332	British Literature in the Age of Enlightenment: 1660-1798
ENGL 333	British Literature in the Age of Romanticism: 1798-1832
ENGL 334	British Literature in the Age of Industrialism: 1832-1914
ENGL 335	British Literature in the Age of Modernism: 1914-Present
ENGL 339	Introduction to Shakespeare
ENGL 340	The Literary Sources of the American Character: 1600-1865
ENGL 341	The Literary Sources of the American Character: 1865-1914
ENGL 342	The Literary Sources of the American Character: 1914-1956
ENGL 343	Multiple Voices of Contemporary American Literature
ENGL 345	Women Writers of the Twentieth Century
ENGL 346	Ethnic American Literature
ENGL 347	African American Literature
ENGL 349	Gender in Twentieth Century Literature
ENGL 350	The Modern Novel
ENGL 351	Modern Poetry
ENGL 352	Modern Drama
ENGL 354	The Bible as Literature and in Literature and the Arts
ENGL 371	Film Styles and Genres
ENGL 372	Film Directors
ENGL 380	Literary Themes
ENGL 381	Diversity in Twentieth-Century American Literature
ENGL 382	LGBT Literature and Media

Senior Project

Definition: The senior project is a capstone experience required for all Cal Poly students receiving a baccalaureate degree. It integrates theory and application from across the student's undergraduate educational experiences. The senior project consists of one or more of the following:

1. a design or construction experience,
2. an experiment,
3. a self-guided study or research project,
4. a presentation,
5. a report based on internship, co-op, or service learning experience,
6. a public portfolio display or performance.

Where the senior project does not consist primarily of a written document, departments, may, where they deem appropriate, require some written documentation (length to be determined by the department) to

accompany the senior project. The precise nature or form of a senior project is to be determined by the department or program of the student's major. The senior project is normally related to the student's field of study, future employment, and/or scholastic goals, and is carried out under direct faculty supervision.

Expected Outcomes

At the discretion of the major department, students are expected to demonstrate some or all of the following abilities:

- Reduce a topic to specific points of analysis.
- Organize the points of analysis into a logical sequence.
- Apply acquired competencies to the successful completion of a project.
- Obtain, evaluate, synthesize, and apply project-related information.
- Develop and follow a project plan.
- Estimate hours of labor and/or cost of materials necessary to complete a project.
- Organize, illustrate, and write clear and concise project documentation.
- Accept supervision when needed.

Requirements

1. The total number of senior project units must be 1 to 6 quarter units.
2. Normally 30 hours of student work is required for each unit of credit granted.
3. Projects requiring an excessive amount of time are discouraged.
4. The number of students participating in a group senior project should not be so large as to unduly limit individual experience or responsibility and initiative.
5. The student is responsible for identifying costs and potential funding sources for his or her senior project prior to initiation of the project. Costly projects are discouraged.
6. It is the student's responsibility to become informed about the university's intellectual properties policy and human subject policy (where applicable).

Library Copy

Senior projects created by Cal Poly students are submitted to Kennedy Library and become part of the library's collection. For more information and details on the process, please see the Library page on depositing senior projects. (<http://lib.calpoly.edu/research-and-help/seniorprojects>)

General Education Mission Statement

General Education: Strengthening intellectual, creative and professional lives

The General Education Program is one of the primary sites for realizing Cal Poly's vision of a comprehensive polytechnic education. The program promotes an understanding and appreciation of the foundational disciplines that ground all intellectual inquiry. It enriches the specialized knowledge acquired in a major program with an understanding of its scientific, humanistic, artistic, and technological contexts. The program imparts knowledge and transferable skills, fosters critical thinking and ethical decision making, supports integrative learning, and prepares students for civic engagement and leadership.

California State University (CSU) General Education Breadth Requirements

Consistent with CSU Executive Order 1100, Cal Poly's General Education Program has been designed to complement major courses and electives completed by each baccalaureate candidate. The General Education program seeks to cultivate graduates who make noteworthy progress toward being well-rounded and informed persons. GE requirements are designed to provide CSU students with the knowledge, skills, experiences, and perspectives that will enable them to expand their capacities to take part in a wide range of human interests and activities; confront personal, cultural, moral, and social problems that are an inevitable part of human life; and develop an enthusiasm for lifelong learning. Faculty are encouraged to assist students in making connections among disciplines to achieve coherence in the undergraduate educational experience.

Courses approved for GE Breadth should be responsive to the need for students to develop knowledge of, or skills related to:

- quantitative reasoning
- information and technological literacy
- intellectual inquiry
- global awareness and understanding of human diversity
- civic engagement
- communication competence
- ethical decision-making
- environmental systems
- lifelong learning
- self-development
- physical and emotional health throughout a lifetime

GE Program Learning Outcomes

Adopted Spring 2014 by the General Education Governance Board

After completing Cal Poly's General Education Program, students will be able to:

1. Construct and critique arguments from a logical perspective.
2. Use appropriate rhetorical strategies to connect with diverse audiences through oral, written, and visual modes of communication.
3. Address real world problems by demonstrating broad disciplinary knowledge, skills, and values in arts, humanities, sciences, and technology.
4. Understand the value of a general education in relation to major course of study.
5. Collaborate with people of different backgrounds, values, and experience.
6. Evaluate global and local issues and their impact on society.
7. Use intention and reflection to develop and improve one's own learning.

GE Course Substitutions

Students are expected to complete the GE courses published for their degree program. Cal Poly GE courses **must** be selected from the approved GE list. Substitutions are not permitted except in extraordinary circumstances. Students requesting exceptions must follow petition

procedures, outlined on the GE web site (<http://www.ge.calpoly.edu>). This process may take several weeks.

GE Study Abroad

Students are strongly encouraged to submit a GE Study Abroad petition before going abroad in order to determine which courses will be granted GE credit. For assistance with GE Study Abroad petitions, contact the Cal Poly International Center office. (<http://international.calpoly.edu>)

Transfer Credit

Transfer credit for GE courses is accepted from California institutions, as approved by the Chancellor's Office. The GE Area letters and numbers at Cal Poly (e.g., GE A1, D4) may be different at other colleges.

For more information, use the Need help with ASSIST (<https://registrar.calpoly.edu/how-use-assist>) located on the Office of the Registrar's website. Some Cal Poly programs specify particular GE courses for Major or Support; these courses must be met with articulated equivalencies. Refer to www.assist.org (<http://www.assist.org/web-assist/welcome.html>) for California Community College both CSU GE lists and specific articulation agreements.

GE Requirements

- All Cal Poly students are required to take 72 quarter units of General Education.
- A minimum of 12 units is required in residence.
- A minimum of 12 units is required at the upper-division level (8 units upper-division for Engineering Programs).
- For students admitted in Fall 2016 or later, a grade of C- or better is required in one course in each of the following GE Areas: A1 (Expository Writing), A2 (Oral Communication), A3 (Reasoning, Argumentation, Writing), and B1 (Mathematics/Statistics).
- Double Counting Lower-Division: Some majors indicate specific GE courses to fulfill both GE and major & support requirements (These are listed in the major's curriculum display). Students should consult their academic advisors during freshman year for clarification.
- Double Counting Upper-Division: Courses from a student's Major department **may not** be used to fulfill upper-division Arts & Humanities (C4) or upper-division Society and the Individual (D5).
- All GE courses are 4 units unless otherwise indicated.
- **X** = non-unit requirement

Abbreviations in Table Below

- **CAED** = College of Architecture & Environmental Design (except Architectural Engineering majors)
- **CAFES** = College of Agriculture, Food, & Environmental Sciences (except BioResource Engineering majors)
- **CLA** = College of Liberal Arts
- **CSM** = College of Science & Mathematics (except LS majors)
- **ENGR** = Majors in: College of Engineering (CENG), BioResource Engineering (BRAE) and Architectural Engineering (ARCE)
- **LS** = Liberal Studies Majors
- **LAES** = Liberal Arts & Engineering Studies Majors
- **OCOB** = Orfalea College of Business

GE FOUNDATIONAL LEARNING (Lower-Division Requirements)

Intellectual and Practical Skills, Knowledge of Human Cultures, and Personal and Social Responsibility

Students are encouraged to complete GE Communication (Area A) classes during their freshman year. The three-course Communication sequence provides instruction and practice in writing, speaking, and critical thinking - foundational knowledge students will build upon in upper-division courses. Completion of this sequence is a prerequisite for many other GE classes.

Students are also encouraged to complete their lower-division foundational GE classes in Science and Mathematics (Area B), Arts and Humanities (Area C), and Society and the Individual (Area D) by the end of their sophomore year to give them the skills and knowledge to succeed in all their upper-division classes.

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
COMMUNICATION (AREA A)			
Expository Writing (A1-Writing Intensive) ¹	4	4	4
Oral Communication (A2) ¹	4	4	4
Reasoning, Argumentation, Writing (A3-Writing Intensive) ¹	4	4	4
Communication Unit Sub-total	12	12	12

¹ For students admitted in Fall 2016 or later, a grade of C- or better is required in one course in this GE Area.

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
SCIENCE AND MATHEMATICS (AREA B)			
Mathematics/Statistics (B1) ¹	8	8	8
Life Science (B2)	4	4	4
Physical Science (B3)	4	4	4
Lab taken with either Life Science or Physical Science (B4)	X	X	X
Science and Mathematics Elective (B1-B5)	4		
Upper-Division Science and Mathematics (B6)			4
Designated Science and Mathematics Courses			8
Science and Mathematics Unit Sub-total	20	16	28

¹ For students admitted in Fall 2016 or later, a grade of C- or better is required in one course in this GE Area.

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
ARTS AND HUMANITIES (AREA C)			
Literature (C1-Writing Intensive)	4	4	4
Philosophy (C2-Writing Intensive)	4	4	4
Fine and Performing Arts (C3)	4	4	4
Upper-Division Elective (C4)	4	4	4
Arts and Humanities Elective (C1-C5)		4	
Arts and Humanities Unit Sub-total	16	20	16

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
SOCIETY AND THE INDIVIDUAL (AREA D)			
The American Experience (D1-40404)	4	4	4
Political Economy (D2)	4	4	4
Comparative Social Institutions (D3)	4	4	4
Self Development (D4; CSU Area E)	4	4	4
Upper-Division Elective (D5)	4	4	
Society and the Individual Unit Sub-total	20	20	16

GE INTEGRATED AND APPLIED LEARNING (Upper-Division Requirements)

Synthesis and advanced inquiry across disciplines

Most majors are required to take an one upper-division Arts and Humanities (C4) course, one upper-division Society and the Individual (D5) course and and one upper-division Technology (F) course. (Note: ENGR follows a slightly different pattern in upper-division.) These GE courses are integrative in nature and require students to apply knowledge and understanding acquired in lower-division courses. Courses in these areas achieve depth in an advanced study of a subject to new but related areas of inquiry.

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
UPPER-DIVISION			
Arts and Humanities (C4-Writing Intensive)	4	4	4
Society and the Individual (D5-Writing Intensive)	4	4	
Technology (Area F)	4	4	
Upper-division courses unit sub-total	12	12	4
GE TOTAL	72 units	72 units	72 units

General Education Courses

COMMUNICATION (AREA A)

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
COMMUNICATION (AREA A)	12	12	12
Expository Writing (A1)	4	4	4
ENGL 133	Writing & Rhetoric for English as a Second Language Students		
ENGL 134	Writing and Rhetoric		

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
Oral Communication (A2)	4	4	4
COMS 101	Public Speaking		
COMS 102	Principles of Oral Communication		
HNRS 101	Public Speaking		
HNRS 102	Principles of Oral Communication		

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
Reasoning, Argumentation, and Writing (A3)	4	4	4
COMS 126	Argument and Advocacy		
COMS 145	Reasoning, Argumentation, and Writing		
ENGL 145	Reasoning, Argumentation, and Writing		
ENGL 148	Reasoning, Argumentation and Professional Writing		
ENGL 149	Technical Writing for Engineers		
HNRS 145	Reasoning, Argumentation, and Writing		
HNRS 148	Reasoning, Argumentation and Professional Writing		
HNRS 149	Technical Writing for Engineers		
PHIL 126	Logic and Argumentative Writing		

SCIENCE AND MATHEMATICS (AREA B)

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
SCIENCE & MATHEMATICS (AREA B)	20	16	28
Mathematics / Statistics (B1)	8	8	8
HNRS 141	Calculus I		
HNRS 142	Calculus II		
HNRS 143	Calculus III		
MATH 112	Nature of Modern Math		
MATH 116	Precalculus Algebra I		
MATH 117	Precalculus Algebra II		
MATH 118	Precalculus Algebra		

MATH 119	Precalculus Trigonometry
MATH 141	Calculus I
MATH 142	Calculus II
MATH 143	Calculus III
MATH 161	Calculus for the Life Sciences I
MATH 162	Calculus for the Life Sciences II
MATH 182	Calculus for Architecture and Construction Management
MATH 221	Calculus for Business and Economics
MATH 227	Mathematics for Elementary Teaching I
STAT 130	Statistical Reasoning
STAT 217	Introduction to Statistical Concepts and Methods
STAT 218	Applied Statistics for the Life Sciences
STAT 251	Statistical Inference for Management I
STAT 252	Statistical Inference for Management II (5)
STAT 313	Applied Experimental Design and Regression Models

CLA LAES LS		CAED CAFES CSM OCOB	ENGR
Life Science (B2) (B2&4=lab course)		4	4
AEPS 110	People, Pests and Plagues (B2 & B4)		
ANT 250	Biological Anthropology		
ASCI 112	Principles of Animal Science		
BIO 111	General Biology (B2 & B4)		
BIO 114	Plant Diversity and Ecology (B2 & B4)		
BIO 123	Biology of Sex		
BIO 161	Introduction to Cell and Molecular Biology (B2 & B4)		
BIO 227	Wildlife Conservation Biology		
BOT 121	General Botany (B2 & B4)		
MCRO 221	Microbiology (B2 & B4)		
MCRO 224	General Microbiology I (B2 & B4) (5)		
For Engineering students only; concurrent enrollment required:			
BIO 213	Life Science for Engineers		
BRAE/BMED 213	Bioengineering Fundamentals		

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
Physical Science (B3) (B3&4=lab course)	4	4	4
ASTR 101	Introduction to the Solar System		
ASTR 102	Introduction to Stars and Galaxies		
CHEM 110	World of Chemistry (B3 & B4)		
CHEM 111	Survey of Chemistry (B3 & B4)		
CHEM 124	General Chemistry for Physical Science and Engineering I (B3 & B4)		

CHEM 125	General Chemistry for Physical Science and Engineering II (B3 & B4)
CHEM 127	General Chemistry for Agriculture and Life Science I (B3 & B4)
GEOL 102	Introduction to Geology
GEOL 205	Earthquakes
HNRS 131	General Physics I (B3 & B4)
HNRS 132	General Physics II (B3 & B4)
HNRS 134	General Physics IA
PHYS 104	Introductory Physics
PHYS 107	Introduction to Meteorology
PHYS 111	Contemporary Physics for Nonscientists
PHYS 121	College Physics I
PHYS 122	College Physics II (B3 & B4)
PHYS 131	General Physics I (B3 & B4)
PHYS 132	General Physics II (B3 & B4)
PHYS 133	General Physics III (B3 & B4)
PHYS 141	General Physics IA
PSC 101	Matter and Energy (B3 & B4)

	CLA	LAES	LS	CAED	CAFES	ENGR
				CSM	OCOB	
One lab B4 taken with B2 or B3 courses (B4)	X			X		X

	CLA	LAES	LS	CAED	CAFES	ENGR
				CSM	OCOB	
CLA, LS : LAES students select 1 course from B1-B4 or B5	4			0		0

Area B5

CLA and LS students: Select one course from B1-B5.

BIO 112	Environmental Biology and Conservation
BIO 302	Human Genetics
BIO 305	Biology of Cancer
BOT 311	Plants, People and Civilization
FSN 210	Nutrition
GEOL 203	Fossils and the History of Life
LA 220	Landscape Ecology: Concepts, Issues and Interrelationships
PSC 201	Physical Oceanography
PSY 340	Biopsychology
PSY 344	Behavioral Genetics
SS 121	Introductory Soil Science

	CLA	LAES	LS	CAED	CAFES	ENGR
				CSM	OCOB	
Science and Mathematics Upper-Division Elective for ENGR only (B6)	0			0		4

GEOL 305	Fundamentals of Seismology
MATH 304	Vector Analysis

MATH 344	Linear Analysis II
MATH 408	Complex Analysis I
PHYS 412 & PHYS 452	Solid State Physics and Solid State Physics Laboratory
PHYS 417	Nonlinear Dynamical Systems
STAT 312	Statistical Methods for Engineers
STAT 321	Probability and Statistics for Engineers and Scientists
STAT 350	Probability and Random Processes for Engineers

	CLA	LAES	LS	CAED	CAFES	ENGR
				CSM	OCOB	
Additional Science and Mathematics for ENGR only	0			0		8

ARTS AND HUMANITIES (AREA C)

	CLA	LAES	LS	CAED	CAFES	ENGR
				CSM	OCOB	
ARTS AND HUMANITIES (AREA C)	16			20		16
Literature (C1)	4			4		4

ENGL 230	Masterworks of British Literature through the Eighteenth Century
ENGL 231	Masterworks of British Literature from the Late 18th Century to the Present
ENGL 241	American Literature: Beginnings to 1865
ENGL 242	American Literature: 1830 to the Present
ENGL 251	Great Books I: Introduction to Classical Literature
ENGL 252	Great Books II: Medieval to Enlightenment Literature
ENGL 253	Great Books III: Romanticism to Modernism Literature
FR 233	Critical Reading in French Literature
GER 233	Critical Reading in German Literature
HNRS 232	Masterworks of British Literature from the Late 18th Century to the Present
HNRS 251	Great Books I: Introduction to Classical Literature
SPAN 233	Introduction to Hispanic Readings

	CLA	LAES	LS	CAED	CAFES	ENGR
				CSM	OCOB	
Philosophy (C2)	4			4		4

HNRS 230	Philosophical Classics: Knowledge and Reality
HNRS 231	Philosophical Classics: Ethics and Political Philosophy
PHIL 230	Philosophical Classics: Knowledge and Reality

PHIL 231	Philosophical Classics: Ethics and Political Philosophy
----------	---

	CLA	LAES	LS	CAED	CAFES	ENGR
				CSM	OCOB	

Fine and Performing Arts (C3)	4			4		4
-------------------------------	---	--	--	---	--	---

ARCE 260	History of Structures
ARCH 217	History of World Architecture: Prehistory - Middle Ages
ARCH 218	History of World Architecture: Middle Ages - 18th Century
ARCH 219	History of World Architecture: 18th Century - Present
ART 101	The Fundamentals of Drawing
ART 111	Introduction to Art
ART 112	Survey of Western Art
ART 122	Basic Digital Photography
ART 148	Beginning Sculpture
COMS 208	Performance of Literature
DANC 221	Dance Appreciation
LA 211	History of Landscape Architecture: Ancient Civilizations through Colonial America
LA 212	History of Modern and Contemporary Landscape Architecture
MU 101	Introduction to Music Theory
MU 120	Music Appreciation
MU 221	Jazz Styles (USCP)
MU 227	Popular Music of the USA (USCP)
MU 229	Music of the 60's: War and Peace (USCP)
TH 210	Introduction to Theatre
TH 227	Theatre History I
TH 228	Theatre History II

	CLA	LAES	LS	CAED	CAFES	ENGR
				CSM	OCOB	

Arts and Humanities Upper-Division Elective (C4)	4			4		4
--	---	--	--	---	--	---

Courses from student's Major Dept do not receive C4 credit

ARCH 320	Topics in Architectural History
ARCH 326	Native American Architecture and Place (USCP)
ART 311	Art History - Nineteenth Century Art
ART 314	History of Photography
ART 318	Asian Art Topics: National, Religious, and Intellectual Movements
ART 370	Michelangelo
ART 371	Topics in Renaissance Art
COMS 308	Group Performance of Literature
DANC 321	Cultural Influence on Dance in America (USCP)

ENGL 330	British Literature in the Age of Belief: to 1485
ENGL 331	British Literature in the Age of Discovery: 1485-1660
ENGL 332	British Literature in the Age of Enlightenment: 1660-1798
ENGL 333	British Literature in the Age of Romanticism: 1798-1832
ENGL 334	British Literature in the Age of Industrialism: 1832-1914
ENGL 335	British Literature in the Age of Modernism: 1914-Present
ENGL 339	Introduction to Shakespeare
ENGL 340	The Literary Sources of the American Character: 1600-1865
ENGL 341	The Literary Sources of the American Character: 1865-1914
ENGL 342	The Literary Sources of the American Character: 1914-1956
ENGL 343	Multiple Voices of Contemporary American Literature
ENGL 345	Women Writers of the Twentieth Century (USCP)
ENGL 346	Ethnic American Literature (USCP)
ENGL 347	African American Literature (USCP)
ENGL 349	Gender in Twentieth Century Literature (USCP)
ENGL 350	The Modern Novel
ENGL 351	Modern Poetry
ENGL 352	Modern Drama
ENGL 354	The Bible as Literature and in Literature and the Arts
ENGL 370	World Cinema
ENGL 371	Film Styles and Genres
ENGL 372	Film Directors
ENGL 380	Literary Themes
ENGL 381	Diversity in Twentieth-Century American Literature (USCP)
ENGL 382	LGBT Literature and Media (USCP)
ENGL 386	Creative Nonfiction
ENGL 387	Fiction Writing
ENGL 388	Poetry Writing
ES 300	Chicano/a Non-Fiction Literature (USCP)
ES 326	Native American Architecture and Place (USCP)
ES 340	Cultural Production and Ethnicity
ES 360	Ethnicity and the Land (USCP)
FR 305	Significant Works in French
FR 350	French Literature in English Translation
GER 305	Significant Works in German
GER 350	German Literature in English Translation
HNRS 304	Values and Technology

HNRS 320	Topics and Issues in Values, Media and Culture
HNRS 332	British Literature in the Age of Enlightenment: 1660-1798
HNRS 333	British Literature in the Age of Romanticism: 1798-1832
HNRS 336	Social Ethics (USCP)
HNRS 341	The Literary Sources of the American Character: 1865-1914
HNRS 342	The Literary Sources of the American Character: 1914-1956
HNRS 343	Multiple Voices of Contemporary American Literature
HNRS 345	Women Writers of the Twentieth Century (USCP)
HNRS 347	African American Literature (USCP)
HNRS 352	Modern Drama
HNRS 380	Literary Themes
ISLA 303	Values and Technology
ISLA 320	Topics and Issues in Values, Media and Culture
MU 324	Music and Society (USCP)
MU 328	Women in Music
NR 360	Ethnicity and the Land (USCP)
PHIL 309	Early Greek Philosophy through Plato
PHIL 310	Aristotle and Hellenistic Philosophy
PHIL 312	Medieval Philosophy
PHIL 313	Early Modern Rationalism
PHIL 314	Early Modern Empiricism
PHIL 315	Kant and 19th Century European Philosophy
PHIL 317	History of Analytic Philosophy
PHIL 318	Phenomenology
PHIL 319	Existentialism
PHIL 320	Asian Philosophy
PHIL 321	Philosophy of Science
PHIL 322	Philosophy of Technology
PHIL 323	Ethics, Science and Technology
PHIL 327	Robot Ethics
PHIL 328	Technologies and Ethics of Warfare
PHIL 331	Ethics
PHIL 332	History of Ethics
PHIL 333	Political Philosophy
PHIL 334	Philosophy of Law
PHIL 335	Social Ethics (USCP)
PHIL 336	Feminist Ethics, Gender, Sexuality and Society (USCP)
PHIL 337	Business Ethics
PHIL 339	Biomedical Ethics
PHIL 340	Environmental Ethics
PHIL 341	Professional Ethics
PHIL 342	Philosophy of Religion
PHIL 343	Continental Political Philosophy
PHIL 350	Aesthetics

PHIL 351	Philosophy of Literature
PHIL 369	Postmodernism
RELS 301	Religions of Asia
RELS 302	Abrahamic Religions: Judaism, Christianity, and Islam
RELS 304	Judaism
RELS 306	Hinduism
RELS 307	Buddhism
RELS 310	Christianity
RELS 311	Islam
RELS 370	Religion, Gender, and Society (USCP)
RELS 372	Spiritual Extremism: Asceticism, Mysticism, and Madness
RELS 374	Religion and Violence
RELS 378	Religion and Contemporary Values
SPAN 305	Significant Works in Spanish
SPAN 307	Spanish and Latin American Film
SPAN 340	Chicano/a Authors (USCP)
SPAN 350	Hispanic Literature in English Translation
SPAN 351	Chicano/Latino Writers in the United States (USCP)
TH 305	Topics in Diversity on the American Stage
TH 360	Theatre in the United States
TH 390	Global Theatre and Performance
WGS 336	Feminist Ethics, Gender, Sexuality and Society (USCP)
WGS 370	Religion, Gender, and Society (USCP)
WLC 310	Humanities in World Cultures
WLC 312	Humanities in Chicano/a Culture (USCP)

CAED, CAFES, CSM and OCOB students: Select any course from C1 - C5

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
Arts and Humanities Elective 0 (C5)		4	0

Area C5 Courses

CHIN 201	Intermediate Mandarin Chinese I
CHIN 202	Intermediate Mandarin Chinese II
CHIN 203	Intermediate Mandarin Chinese III
FR 201	Intermediate French I
FR 202	Intermediate French II
FR 203	Intermediate French III
GER 201	Intermediate German I
GER 202	Intermediate German II
GER 203	Intermediate German III
ITAL 201	Intermediate Italian I
JPNS 201	Intermediate Japanese I
SPAN 201	Intermediate Spanish I
SPAN 202	Intermediate Spanish II

SPAN 203 Intermediate Spanish III

SOCIETY & THE INDIVIDUAL (AREA D/E)

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
SOCIETY AND THE INDIVIDUAL	20	20	16
The American Experience (40404) (D1)	4	4	4

ES 112 Race, Culture and Politics in the United States (USCP)

HIST 201 United States History to 1865 (USCP)

HIST 202 United States History Since 1865 (USCP)

HIST 206 American Cultures (USCP)

HIST 207 Freedom and Equality in American History (USCP)

HNRS 112 Race, Culture and Politics in the United States (USCP)

HNRS 207 Freedom and Equality in American History (USCP)

POLS 112 American and California Government

WGS 201 Introduction to Women's and Gender Studies in the United States (USCP)

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
Political Economy (D2)	4	4	4

ECON 201 Survey of Economics

ECON 222 Macroeconomics

HIST 213 Modern Political Economy

HIST 214 Political Economy of Latin America and the Middle East

HNRS 201 Survey of Economics

HNRS 213 Modern Political Economy

SOC 218 International Political Economy

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
Comparative Social Institutions (D3)	4	4	4

ANT 201 Cultural Anthropology

ANT 202 World Prehistory

ES 212 Global Origins of United States Cultures (USCP)

ES 241 Survey of Indigenous Studies (USCP)

ES 242 Survey of Africana Studies (USCP)

ES 243 Survey of Latino/a Studies (USCP)

ES 244 Survey of Asian American Studies (USCP)

GEOG 150 Human Geography

HIST 210 World History I

HIST 216 Comparative Social Movements

HIST 221 World History, Beginnings to 1000

HIST 222 World History, 1000 - 1800

HIST 223 World History, 1800 - Present

HIST 225 The World at War

HNRS 161 Creating Sustainable Communities I

HNRS 162 Creating Sustainable Communities II

HNRS 212 Global Origins of United States Cultures (USCP)

HNRS 216 Comparative Social Movements

HNRS 223 World History, 1800 - Present

RELS 201 Religion, Dialogue, and Society

RPTA 201 Sociocultural Dimensions of Work and Leisure

SOC 110 Comparative Societies

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
Self Development (D4, CSU Area E)	4	4	4

COMS 218 Media, Self and Society

DANC 210 Active Wellness

EDES 123 Principles of Environmental Design

FSN 250 Food and Nutrition: Customs and Culture (USCP)

JOUR 218 Media, Self and Society

KINE 250 Healthy Living

KINE 255 Personal Health: A Multicultural Approach (USCP)

KINE 260 Women's Health Issues (USCP)

PSY 201 General Psychology

PSY 202 General Psychology

	CLA LAES LS	CAED CAFES CSM OCOB	ENGR
Society and the Individual Upper-Division Elective (D5)	4	4	0

Courses from student's major do not receive D5 credit.

ANT 325 Pre-Columbian Mesoamerica

ANT 330 Indigenous South Americans

ANT 344 Sex, Death, and Human Nature

ANT 345 Human Behavioral Ecology

ANT 360 Human Cultural Adaptations

BUS 311 Managing Technology in the International Legal Environment

COMS 316 Intercultural Communication (USCP)

COMS 386 Communication, Media, and Politics

CRP 304 Intergroup Dialogues

CRP 325 Reflections on Biking, Walking and the City

CRP 334 Cities in a Global World

ECON 303 Economics of Poverty, Discrimination and Immigration (USCP)

ECON 304 Comparative Economic Systems

ES 308	Fire and Society	HNRS 312	East Asian Culture and Civilization
ES 310	Hip-Hop, Poetics and Politics (USCP)	HNRS 317	The Lure of the Sea
ES 320	African American Cultural Images (USCP)	HNRS 323	Modern America
ES 321	Native American Cultural Images (USCP)	HNRS 324	The Historical Novel in the United States, 1960s to the Present
ES 322	Asian American Cultural Images (USCP)	HNRS 334	Modern Europe, 1789-1914
ES 323	Mexican American Cultural Images (USCP)	HNRS 335	Modern Europe, 1914-Present
ES 330	The Chinese American Experience (USCP)	HNRS 340	Sexuality Studies
ES 335	The Filipina/o American Experience (USCP)	HNRS 391	Appropriate Technology for the World's People: Development
ES 345	Queer Ethnic Studies (USCP)	ISLA 315	Critical Issues in Latin American Studies
ES 351	Gender, Race, Class, Nation in Global Engineering, Technology & International Development	ISLA 316	London: From Roman Colony to World Capital
ES 380	Critical Race Theory (USCP)	KINE 323	Sport and Gender (USCP)
ES 381	The Social Construction of Whiteness (USCP)	KINE 324	Sports, Media and American Popular Culture (USCP)
GEOG 300	Geography of United States	NR 308	Fire and Society
GEOG 301	Geography of Resource Utilization	NR 323	Human Dimensions in Natural Resources Management
GEOG 308	Global Geography	NR 324	Social Dimensions of Sustainable Food and Fiber Systems
GEOG 370	Geography of Latin America	POLS 325	Global Political Issues
GEOG 380	Geography of the Caribbean	POLS 337	U.S. and China in the Contemporary World
HIST 306	The Witch-Hunts in Europe, 1400-1800	POLS 338	Critical Issues in American Politics
HIST 307	European Thought 1800-2000	POLS 339	Authoritarian and Democratic Rule
HIST 308	The Trans-Atlantic Slave Trade	POLS 348	Early American Political Thought
HIST 309	Cultures of West Africa and the African Diaspora	POLS 349	Contemporary American Political Thought
HIST 310	East Asian Culture and Civilization	PSC 391	Appropriate Technology for the World's People: Development
HIST 316	Modern East Asia	PSY 304	Intergroup Dialogues
HIST 317	The Lure of the Sea	PSY 311	Environmental Psychology
HIST 318	The City in the Modern World	PSY 318	Psychology of Aging
HIST 319	Modern South and Southeast Asia	PSY 352	Conflict Resolution: Violent and Nonviolent
HIST 320	Colonial and Revolutionary America	RELS 344	Approaches to Religion and Spirituality
HIST 321	Civil War America	SOC 315	Global Race and Ethnic Relations
HIST 322	Modern America	SOC 326	Sociology of the Life Cycle
HIST 324	The Historical Novel in the United States, 1960s to the Present	SOC 327	Social Change (USCP)
HIST 326	United States Foreign Relations since 1898	SOC 377	Sociology of Religion
HIST 334	Modern Europe, 1789-1914	UNIV 391	Appropriate Technology for the World's People: Development
HIST 335	Modern Europe, 1914-Present	WGS 301	Contemporary Issues in Women's and Gender Studies (USCP)
HIST 336	Britain at War: The British, the Americans and the Struggle for Freedom, 1939-1945	WGS 302	Contemporary Issues in Queer Studies (USCP)
HIST 337	Colonial Latin America	WGS 320	Women, Gender and Sexuality in Global Perspective
HIST 338	Modern Latin America	WGS 340	Sexuality Studies
HIST 350	The Scientific Revolution, c. 1500-1800	WGS 345	Queer Ethnic Studies (USCP)
HNRS 303	Economics of Poverty, Discrimination and Immigration (USCP)		

WGS 351	Gender, Race, Class, Nation in Global Engineering, Technology & International Development
WLC 370	Language, Technology and Society

TECHNOLOGY UPPER-DIVISION ELECTIVE (AREA F)

	CLA	LAES	LS	CAED	CAFES	ENGR
				CSM	OCOB	
TECHNOLOGY UPPER-DIVISION ELECTIVE (F)	4			4		0
AEPS 315	Organic Crop Production					
AEPS 329	Plants, Food, and Biotechnology					
AERO 310	Air and Space					
AG 315	Organic Crop Production					
AG 330	Cal Poly Land: Nature, Technology, and Society					
AG 350	The Global Environment					
AG 360	Holistic Management					
ASCI 360	Holistic Management					
ASTR 324	Longitude, Navigation, and Timekeeping					
BIO 308	Genetic Engineering Technology					
BOT 329	Plants, Food, and Biotechnology					
BRAE 340	Irrigation Water Management					
BRAE 348	Energy for a Sustainable Society					
CHEM 308	Genetic Engineering Technology					
CHEM 349	Chemical and Biological Warfare					
CM 317	Sustainability and the Built Environment					
CRP 338	Digital Cities					
CRP 339	Disaster-Resistant Sustainable Communities					
CSC 302	Computers and Society					
CSC 310	Computers for Poets					
CSC 311	Computational Art					
CSC 320	Practical Computer Security for Everyone					
EDES 350	The Global Environment					
EE 322	Microcontrollers for Everyone					
ENGR 302	Transportation and Manufacturing in the Twenty-First Century					
ENGR 350	The Global Environment					
ENVE 323	Engineering for the Environment					
ENVE 324	Introduction to Air Pollution					
ERSC 335	Soil, Water, and Civilization					
ES 350	Gender, Race, Culture, Science and Technology (USCP)					
FSN 319	Food Technology for the Consumer					
GEOG 350	The Global Environment					
GRC 377	Web and Print Publishing					
HIST 354	History of Network Technology					
HIST 359	Living in a Material World					
HNRS 310	Air and Space					

HNRS 311	Computers for Poets
HNRS 392	Appropriate Technology for the World's People: Design
IME 320	Human Factors and Technology
ISLA 305	Topics in Public Engagements with STEM
ISLA 330	Cal Poly Land: Nature, Technology, and Society
ISLA 350	The Global Environment
ITP 330	Packaging Fundamentals
ITP 341	Packaging Polymers and Processing
LA 317	The World of Spatial Data and Geographic Information Technology
MATE 359	Living in a Material World
ME 320	Consumer Energy Guide
ME 323	Everything is Designed: The Invention and Evolution of Products
MSCI 307	World Aquaculture: Applications, Methodologies and Trends
MSCI 330	Technologies for Ocean Discovery
NR 312	Technology of Wildland Fire Management
NR 317	The World of Spatial Data and Geographic Information Technology
NR 321	Water Systems Technology, Issues and Impacts
POLS 333	World Food Systems
PSC 307	Nuclear Weapons in the Post-9/11 World
PSC 320	Energy, Society and the Environment
PSC 392	Appropriate Technology for the World's People: Design
RELS 376	Religion, Science and Technology
SCM 320	Technology in London
SCM 335	Nuclear Science and Society
SCM 350	The Global Environment
SCM 360	Selected Environmental Issues of California's Central Coast
UNIV 330	Cal Poly Land: Nature, Technology, and Society
UNIV 333	World Food Systems
UNIV 350	The Global Environment
UNIV 392	Appropriate Technology for the World's People: Design
WGS 350	Gender, Race, Culture, Science and Technology (USCP)

United States Cultural Pluralism (USCP)

United States Cultural Pluralism (USCP) courses must focus on all of the following:

1. One or more diverse groups, as defined in the Cal Poly Statement on Diversity (p. 7), whose contributions to contemporary American society have been impeded by conflict or restricted opportunities
2. Contemporary social issues resulting from conflict or restricted opportunities, including, but not limited to, problems associated with

discrimination based on age, ethnicity, gender, nationality, abilities, religion, sexual orientation, socioeconomic status, or race

3. Critical thinking skills used by students to approach these contemporary social issues, examine their own attitudes, and consider the diverse perspectives of others
4. The contributions of people from diverse groups to contemporary American society

In addition to satisfying these criteria, USCP courses must also address the Diversity Learning Objectives (p. 7).

Students are required to complete *one* USCP course. This course also fulfills a requirement for Major, Support, General Education, or Free Elective category.

The following courses fulfill the United States Cultural Pluralism requirement.

ANT 415	Native American Cultures	4
ARCH 326	Native American Architecture and Place (C4) ¹	4
COMS 316	Intercultural Communication (D5) ¹	4
CRP 215	Planning for and with Multiple Publics	4
DANC 321	Cultural Influence on Dance in America (C4) ¹	4
ECON 303	Economics of Poverty, Discrimination and Immigration (D5) ¹	4
ENGL 345	Women Writers of the Twentieth Century (C4) ¹	4
ENGL 346	Ethnic American Literature (C4) ¹	4
ENGL 347	African American Literature (C4) ¹	4
ENGL 349	Gender in Twentieth Century Literature (C4) ¹	4
ENGL 381	Diversity in Twentieth-Century American Literature (C4) ¹	4
ENGL 382	LGBT Literature and Media (C4) ¹	4
ES 112	Race, Culture and Politics in the United States (D1) ¹	4
ES 114	Introduction to Ethnic Studies: Race in the United States	4
ES 212	Global Origins of United States Cultures (D3) ¹	4
ES 215	Planning for and with Multiple Publics	4
ES 241	Survey of Indigenous Studies (D3) ¹	4
ES 242	Survey of Africana Studies (D3) ¹	4
ES 243	Survey of Latino/a Studies (D3) ¹	4
ES 244	Survey of Asian American Studies (D3) ¹	4
ES 300	Chicano/a Non-Fiction Literature (C4) ¹	4
ES 310	Hip-Hop, Poetics and Politics (D5) ¹	4
ES 320	African American Cultural Images (D5) ¹	4
ES 321	Native American Cultural Images (D5) ¹	4

ES 322	Asian American Cultural Images (D5) ¹	4
ES 323	Mexican American Cultural Images (D5) ¹	4
ES 325	Sexuality and Gender in African American Communities	4
ES 326	Native American Architecture and Place (C4) ¹	4
ES 330	The Chinese American Experience (D5) ¹	4
ES 335	The Filipina/o American Experience (D5) ¹	4
ES 345	Queer Ethnic Studies (D5) ¹	4
ES 350	Gender, Race, Culture, Science and Technology (Area F) ¹	4
ES 360	Ethnicity and the Land (C4) ¹	4
ES 380	Critical Race Theory (D5)	4
ES 381	The Social Construction of Whiteness (D5) ¹	4
FSN 250	Food and Nutrition: Customs and Culture (D4) ¹	4
HIST 201	United States History to 1865 (D1) ¹	4
HIST 202	United States History Since 1865 (D1) ¹	4
HIST 206	American Cultures (D1) ¹	4
HIST 207	Freedom and Equality in American History (D1) ¹	4
HIST 208	Survey of California History	4
HIST 406	African-American History from 1865	4
HIST 435	American Women's History from 1870	4
HNRS 112	Race, Culture and Politics in the United States (D1) ¹	4
HNRS 207	Freedom and Equality in American History (D1) ¹	4
HNRS 212	Global Origins of United States Cultures (D3) ¹	4
HNRS 303	Economics of Poverty, Discrimination and Immigration (D3) ¹	4
HNRS 336	Social Ethics (C4) ¹	4
HNRS 345	Women Writers of the Twentieth Century	4
HNRS 347	African American Literature (C4) ¹	4
JOUR 219	Multicultural Society and the Mass Media	4
KINE 255	Personal Health: A Multicultural Approach (D4) ¹	4
KINE 260	Women's Health Issues (D4) ¹	4
KINE 323	Sport and Gender (D5) ¹	4
KINE 324	Sports, Media and American Popular Culture (D5) ¹	4
MU 221	Jazz Styles (C3) ¹	4
MU 227	Popular Music of the USA (C3) ¹	4
MU 229	Music of the 60's: War and Peace (C3) ¹	4

MU 325	America's Music	4
MU 328	Women in Music (C4) ¹	4
NR 360	Ethnicity and the Land (C4) ¹	4
PHIL 335	Social Ethics (C4) ¹	4
PHIL 336	Feminist Ethics, Gender, Sexuality and Society (C4) ¹	4
POLS 310	The Politics of Race, Class, Gender and Sexuality	4
POLS 343	Civil Rights in America	4
POLS 445	Voting Rights and Representation	4
PSY 260	African American Psychology	4
PSY 372	Multicultural Psychology	4
PSY 475	The Social Psychology of Prejudice	4
RELS 370	Religion, Gender, and Society (C4) ¹	4
SOC 316	American Ethnic Minorities	4
SOC 327	Social Change (D5) ¹	4
SPAN 111	Elementary Hispanic Language and Culture	4
SPAN 206	Spanish for Heritage Speakers	4
SPAN 340	Chicano/a Authors (C4) ¹	4
SPAN 351	Chicano/Latino Writers in the United States (C4) ¹	4
TH 305	Topics in Diversity on the American Stage	4
WGS 201	Introduction to Women's and Gender Studies in the United States (D1) ¹	4
WGS 301	Contemporary Issues in Women's and Gender Studies (D5) ¹	4
WGS 302	Contemporary Issues in Queer Studies (D5) ¹	4
WGS 336	Feminist Ethics, Gender, Sexuality and Society (C4) ¹	4
WGS 345	Queer Ethnic Studies (D5) ¹	4
WGS 350	Gender, Race, Culture, Science and Technology (Area F) ¹	4
WGS 370	Religion, Gender, and Society (C4) ¹	4
WGS 435	American Women's History from 1870	4
WGS 450	Feminist Theory	4
WLC 312	Humanities in Chicano/a Culture (C4) ¹	4

¹ Course also satisfies GE requirement

Choice of Catalog / Catalog Rights

Cal Poly issues a new catalog every two years, and the requirements for degree programs may change from one catalog to the next. Students have the right to choose the catalog they will use, as described in Section 40401 of Title 5 of the *California Code of Regulations*.

An undergraduate student remaining in attendance in regular sessions at any California State University campus, at any California Community College, or any combination of California community colleges and campuses of the California State University may, for purposes of meeting graduation requirements, elect to meet the catalog requirements in effect at the campus from which the student will graduate either:

1. at the term the student began such attendance, or
2. at the term of entrance to the campus granting the degree, or
3. at the term of graduation, or
4. as allowed by campus policy: Cal Poly also allows students to elect the requirements of any catalog in effect during their regular attendance.

Campus authorities may authorize or require substitutions for discontinued courses. A campus may require a student changing his or her major or any minor field of study to complete the major or minor requirements in effect at the time of the change.

For purposes of this section, "attendance" means attendance in at least one semester or two quarters each university year. Absence due to an approved leave of absence or for attendance at another accredited institution of higher learning shall not be considered an interruption in attendance, if the absence does not exceed two years.

Choice of Catalog Older than 10 years for Returning Students

Returning students may request to complete their degrees on a catalog older than 10 years only if all remaining degree requirements at the time they left Cal Poly do not exceed 16 units. The decision to approve or disapprove a student's request is based on: (1) her/his willingness to complete the remaining degree requirements within a specified timeframe, and (2) her/his ability to demonstrate, with written documentation, reasonable currency of knowledge and skills in her/his degree field to the satisfaction of the faculty in the applicable major, as certified by the department chair. Both the college dean and the Senior Vice Provost for Academic Programs must give approval.

Currency in the degree field may be demonstrated by additional coursework, in addition to the remaining degree requirements on the student's original catalog, and/or by relevant work experience, to be determined by the department chair. Because Cal Poly degrees are always granted for the term in which requirements are completed, additional requirements may vary, depending on the amount of time elapsed and on the major field, in order to reconcile the curriculum of an older catalog with current trends in the academic discipline.

The expiration of a catalog is determined by adding 10 years to the last term in which that catalog was in effect (e.g., the 2015-17 catalog will be "older than 10 years" after Spring Quarter 2027).

Students are not allowed to complete a degree that is no longer offered by the University.

Note: In addition to the remaining degree requirements on the student's catalog, s/he may also be required to complete the GWR. Check with the Evaluations Unit in the Office of the Registrar.

ACADEMIC STANDARDS AND POLICIES

Academic Placement

Academic Placement for Students Admitted Fall 2018 - Spring 2019

Assessment of Academic Preparation and Placement

The CSU requires that all entering freshmen students be evaluated in terms of their preparation to complete first-year courses in written communication and mathematics/quantitative reasoning. This evaluation will utilize the broadest set of multiple measures including high school grades as well as performance scores on standardized exams such as the ACT or SAT. This evaluation of academic readiness is not a condition for admission to the CSU, but it is an important step for determining the best course placement for entering students.

Successful completion of general education (GE) written communication and mathematics/quantitative reasoning courses in the first year of CSU enrollment establishes a foundation for continuous learning. Unless the requirements have been completed prior to the student's first term on campus, freshmen shall enroll in GE written communication and mathematics/quantitative reasoning courses appropriate to each student's major and skill level, as demonstrated by applicable systemwide standards utilized in the review of academic preparation.

Students whose pre-college skill assessments indicate academic support will be needed for successful completion of GE written communication or mathematics/quantitative courses shall enroll in appropriate college-level, baccalaureate credit-bearing courses that strengthen skills development to facilitate achieving the appropriate general education student learning outcomes. Supportive course models may include, among others, co-requisite approaches, supplemental instruction or "stretch" formats that extend a course beyond one academic term. In these approaches, instructional content considered pre-baccalaureate may carry a maximum of one unit and shall be offered concurrently with a college-level, baccalaureate credit-bearing course.

Multiple Measures Assessment for General Education Written Communication

Based on the systemwide assessment standards for GE written communication below, freshmen shall enroll in appropriate GE written communication courses during their first academic year unless the requirement has been fulfilled.

- Students who have met the following requirements have **fulfilled the GE Written Communication requirement** in preparation for advanced courses:
 - A score of 3 or above on either the Language and Composition examination or the Composition and Literature examination of the College Board Scholastic Advanced Placement Program
 - Completion and transfer to the CSU of the credits for a college course that satisfies the CSU GE requirement in written composition, provided such a course was completed with a grade of C- or better
- Students who have met the following requirements are **ready to enroll in a course that meets the GE Written Communication requirement**:

- A result of 'Standard Exceeded: Ready for CSU or participating CCC college-level coursework in English' earned on the CAASPP Early Assessment Program (EAP) exam
 - A score of 550 or higher on the Evidence Based Reading and Writing section of the *new* SAT Reasoning Test sponsored by the College Board
 - A score of 500 or higher on the Evidence Based Reading and Writing section of the *old* SAT Reasoning Test sponsored by the College Board
 - A score of 22 or above on the ACT English test
 - Completion of an approved 12th grade, year-long, English course with a grade of C- or better *AND* a score of 510 – 540 on the Evidence Based Reading and Writing section of the *new* SAT Reasoning Test *or* a score of 460-490 on the Evidence Based Reading and Writing section of the *old* SAT Reasoning Test
 - Completion of an approved 12th grade, year-long, English course with a grade of C- or better *AND* a score of 19-21 on the ACT English test
 - A result of 'Standard Met: Conditionally Ready for CSU or participating CCC college-level coursework in English' on the CAASPP Early Assessment Program (EAP) exam *AND* completion of an approved 12th grade, year-long, English course with a grade of C- or better
 - Achievement of a weighted high school GPA ≥ 3.3 *OR* a high school GPA ≥ 3.0 and completion of an approved 12th grade, year-long, English course (AP, IB, ERWC) or Honors English or more than 5 years of high school English
- Students who have met the following requirements are **ready to enroll in a course that meets the GE Written Communication requirement and includes supported instruction**:
 - Completion of 4+ years of standard college preparatory high school English courses *AND* a score of 510-540 on the Evidence Based Reading and Writing section of the *new* SAT Reasoning Test or a score of 460-490 on the Evidence Based Reading and Writing section of the *old* SAT Reasoning Test or a score of 19-21 on the ACT English test
 - Achievement of a weighted high school GPA ≥ 3.0 and 4 years of standard college preparatory high school English courses

- Students who have met the following requirements are **required to participate in the Early Start Program and are ready to enroll in a course that meets the GE Written Communication requirement and includes supported instruction**:
 - A score less than 510 on the Evidence Based Reading Writing section of the *new* SAT Reasoning Test or a score less than 460 on the *old* SAT Reasoning Test *AND* achievement of a high school grade point average of ≤ 3.0
 - A score less than 19 on the ACT English test and the achievement of a high school GPA of ≤ 3.0

Multiple Measures Assessment for General Education Mathematics/Quantitative Reasoning

Based on the systemwide assessment standards for GE mathematics/quantitative reasoning below, freshmen shall enroll in appropriate general education mathematics/quantitative reasoning courses during their first academic year unless the requirement has been fulfilled.

- Students who have met the following requirements have **fulfilled the GE Math/Quantitative Reasoning requirement** and are permitted to enroll in the next level of math:

- A score of 3 or above on the College Board Advanced Placement Calculus AB or Calculus BC tests
 - A score of 3 or above on the College Board Advanced Placement Statistics test
 - A score of 4 or above on the International Baccalaureate Mathematics Higher Level (HL)
 - A score of 50 or above on the College Board College Level Examination Program (CLEP) Calculus, College Algebra, College Algebra-Trigonometry, Pre-Calculus, or Trigonometry
 - Completion and transfer to the CSU of the credits for a college course that satisfies the CSU General Education requirement in mathematics/quantitative reasoning, provided such a course was completed with a grade of C- or better
- Students who are **STEM majors** who have met the following requirements are **ready to enroll in a course that meets the GE Math/Quantitative Reasoning requirement**:
 - A result of 'Standard Exceeded: Ready for CSU or participating CCC college-level coursework in mathematics' on the CAASPP Early Assessment Program (EAP) exam
 - A score of 570 or above on the mathematics section of the *new* SAT Reasoning Test
 - A score of 550 or above on the mathematics section of the *old* SAT Reasoning Test
 - A score of 550 or above on the SAT Subject Test in Mathematics (level 1 or level 2)
 - A score of 23 or above on the ACT Mathematics test
 - Completion of a 12th grade mathematics course beyond algebra 2 with a grade of C- or better and a score of 520-560 on the new SAT mathematics test *or* a score of 490-540 on the old SAT mathematics test
 - Completion of a 12th grade mathematics course beyond algebra 2 with a grade of C- or better and a score of 20-22 on the ACT Mathematics test
 - A result of 'Standard Met: Conditionally Ready for CSU or participating CCC college-level coursework in mathematics' on the CAASPP Early Assessment Program (EAP) exam *AND* completion of a 12th grade mathematics course with a grade of C- or better
 - Achievement of a weighted high school GPA ≥ 3.7
 - Achievement of a weighted high school mathematics GPA ≥ 3.5 and 5+ years of mathematics or quantitative reasoning courses
 - Achievement of a weighted high school mathematics GPA ≥ 3.5 and completion of an approved senior year course
 - Students who are **Non-STEM majors** who have met the following requirements are **ready to enroll in a course that meets the GE Math/Quantitative Reasoning requirement**:
 - Completion of a 12th grade mathematics course beyond algebra 2 with a grade of C- or better and a score of 520-560 on the new SAT mathematics test *or* a score of 490-540 on the old SAT mathematics test
 - Completion of a 12th grade mathematics course beyond algebra 2 with a grade of C- or better and a score of 20-22 on the ACT Mathematics test
 - A result of 'Standard Met: Conditionally Ready for CSU or participating CCC college-level coursework in mathematics' on the CAASPP Early Assessment Program (EAP) exam *AND* completion of a 12th grade mathematics course with a grade of C- or better
 - Achievement of a weighted high school GPA ≥ 3.7
 - Achievement of a weighted high school mathematics GPA ≥ 3.5 and 5+ years of mathematics or quantitative reasoning courses
 - Achievement of a weighted high school mathematics GPA ≥ 3.5 and completion of an approved senior year course
 - Students who are **Non-STEM majors** who have met the following requirements are **ready to enroll in a course that meets the GE Math/Quantitative Reasoning requirement and includes supported instruction**:
 - Achievement of a high school mathematics GPA ≥ 3.3
 - Students who are **Non-STEM majors** who have met the following requirements are **ready to enroll in a course that meets the GE Math/Quantitative Reasoning requirement and includes supported instruction**:
 - Achievement of a high school mathematics GPA ≥ 3.3
 - Achievement of a high school GPA ≥ 3.0
 - Students who have met the following requirements are **required to participate in the Early Start Program and are ready to enroll in a course that meets the GE Math/Quantitative Reasoning requirement and includes supported instruction**:
 - A score less than 510 on the mathematics section of the *new* SAT Reasoning test *or* a score less than 490 on the mathematics section of the *old* SAT Reasoning test *AND* a high school GPA ≤ 3.2
 - A score less than 20 on the ACT Mathematics test *AND* a high school GPA ≤ 3.2

Academic Placement for Students Admitted Summer 2017 - Summer 2018

The California State University utilizes scores from pre-college examinations to determine first-year placement in English and mathematics. Based on test scores, each entering undergraduate is considered to be ready, conditionally ready, or not ready for college-level courses. Those who are not ready must take the CSU English Placement Test (EPT) and the CSU Entry Level Mathematics (ELM) examination after admission and prior to enrollment. These placement tests are not a condition for admission to the CSU, but they are a condition for enrollment. The examinations are designed to identify entering

students who may need additional support in acquiring the college entry-level English and mathematics skills necessary to succeed in CSU baccalaureate-level courses.

English Placement Test (EPT)

Purpose of the EPT

The EPT is designed to assess the level of reading and writing skills of undergraduate students entering Cal Poly so that they can enroll in appropriate composition courses. Those undergraduate students who do not demonstrate college-level skills on the EPT are then advised to enroll in courses designed to help them attain those skills. Students may take the EPT only once. It may not be repeated.

Who Must Take the EPT

All non-exempt entering undergraduates must complete the EPT prior to enrollment in any course, including developmental writing courses.

An exemption from the EPT is granted to students who present proof of one of the following:

- A CAASPP Early Assessment Program (EAP) exam result of Standard Exceeded: "Ready" for CSU or participating CCC college-level coursework in English
- A **new** SAT score of 550 or above on the Evidenced Based Reading and Writing section*
- An **old** SAT score of 500 or above on the Critical Reading section of the old SAT Reasoning Test
- A score of 22 or above on the ACT English Test
- A score of 3 or above on either the Language and Composition or Composition and Literature examination of the College Board Scholastic Advanced Placement Program
- Completion and transfer of credits for a California community college English course that satisfies the CSU General Education requirement in English Composition, provided such a course was completed with a grade of C or better.

** In March 2016, the College Board began administering a new SAT. The new SAT scores are different than the old SAT scores. The CSU will accept both old and new SAT scores for students graduating in 2020 and prior. Students graduating after 2020 will be required to take the new SAT.*

An exemption from the EPT may also be granted to students who have a CAASPP Early Assessment Program (EAP) test result of "Conditionally Ready" for the CSU based on a score between 510 - 540 on the **new** SAT Evidenced Based Reading and Writing Section, a score between 460 - 490 on the **old** SAT Critical Reading section, or a score of 19 - 21 on the English section of the ACT Test.

Those who are conditionally ready for college-level English coursework may be exempt from taking the EPT if they present proof of the following:

- A grade of "C" or better in an approved yearlong 12th grade English course.

Students who do not clear their "Conditionally Ready" status will need to participate in the CSU's Early Start Program and may opt to take the EPT. Any student who takes the EPT must earn a score of 147 or above in order to be placed in a college-level English course.

Registration Holds/Disenrollment

CSU Trustee policy requires that all non-exempt students take the EPT examination after admission and before enrollment in the CSU. At Cal Poly, failure to take the EPT examination or submit proof of a

documented exemption before enrollment results in a hold on registration privileges and may lead to disenrollment from the University.

Students subject to the EPT requirement are notified by email.

Additional information about the EPT is available on the University Writing and Rhetoric Center website: writingcenter.calpoly.edu/content/ept/index.

Remediation

All students who score below 147 on the EPT are required to enroll in Cal Poly's Writing and Rhetoric Stretch Program during their first year of coursework. Students who do not make adequate progress in completing the program during their first year of enrollment face disqualification from the University.

In the Writing and Rhetoric Stretch Program, students complete two quarters of coursework as a cohort with the same instructor. Coursework is taken in the following sequence:

- First, students enroll in either ENGL 92 Basic Writing or ENGL 93 Essay Writing for English as a Second Language Students
- After earning credit for either ENGL 92 Basic Writing or ENGL 93 Essay Writing for English as a Second Language Students, students enroll in ENGL 96 Writing and Rhetoric Tutorial *concurrently* with either ENGL 134 Writing and Rhetoric or ENGL 133 Writing & Rhetoric for English as a Second Language Students.

Note: Failure to complete successfully ENGL 92/ ENGL 93 or ENGL 96 results in a grade of F in ENGL 134/ ENGL 133.

Upon successful completion of the Writing and Rhetoric Stretch Program, students fulfill their remediation requirement and earn credit in GE Area A1.

Entry Level Mathematics (ELM) Exam

Purpose of the ELM

The Entry Level Mathematics (ELM) Examination is designed to assess and measure the level of mathematics skills acquired through three years of rigorous college preparatory mathematics coursework (Algebra I and II, and Geometry) of students entering the California State University (CSU). Students may take the ELM multiple times.

Who Must Take the ELM

The CSU ELM must be completed by all non-exempt entering undergraduates prior to enrollment in any course, including remedial courses.

An exemption from the ELM is granted to students who present proof of one of the following:

- A CAASPP Early Assessment Program (EAP) exam result of Standard Exceeded: "Ready" for CSU or participating CCC college-level coursework in mathematics
- A **new** SAT score of 570 or above on the mathematics section of the new SAT*
- An **old** SAT score of 550 or above on the mathematics section of the old SAT Reasoning Test
- An SAT Subject Test score of 550 or above on the SAT Subject Test in Mathematics (level 1 or level 2)**
- A score of 23 or above on the ACT Mathematics Test
- A score of 3 or above on the College Board Advanced Placement Calculus AB or Calculus BC

- A score of 3 or above on the College Board Advanced Placement Statistics examination
- Completion and transfer to CSU of a California community college course that satisfies the requirement in Quantitative Reasoning, provided such a course was completed with a grade of "C" or better

**In March 2016, the College Board began administering a new SAT. The new SAT scores are different than the old SAT scores. The CSU will accept both old and new SAT scores for students graduating in 2020 and prior. Students graduating after 2020 will be required to take the new SAT.*

****NOTE:** *there were no changes to the SAT Subject Tests; therefore, the cut score for the Subject Test in Mathematics (levels 1 or 2) remains the same.*

An exemption from the ELM may also be granted to students who have a CAASPP Early Assessment Program (EAP) test result of "Conditionally Ready" for the CSU based on a score between 520-660 on the mathematics section of the new SAT Test, a score between 490-540 on the mathematics section of the Reasoning, or a score between 20 - 22 on the mathematics section of the ACT Test.

Those who are conditionally ready for college-level mathematics courses may be exempt from taking the ELM if they present proof of:

- A grade of "C" or better in an approved yearlong 12th grade math course.

Students who do not clear the conditional status will need to participate in the CSU's Early Start Program and may opt to take the ELM. Any student who takes the ELM must earn a score 50 or above in order to be placed in college-level mathematics classes.

Registration Holds/Disenrollment

CSU Trustee policy requires that all non-exempt students take the ELM examination after admission and before enrollment in the CSU. At Cal Poly, failure to take the ELM examination or submit proof of a documented exemption before enrollment results in a hold on registration privileges and may lead to disenrollment from the University.

In addition, students who do not demonstrate requisite competence are required to enroll in appropriate remedial or developmental programs during the first term of enrollment and each subsequent term until such time as they demonstrate competence. Students who do not demonstrate proficiency within the first year of enrollment face disqualification from the University.

At Cal Poly, students **may not** enroll in any college-level mathematics or statistics course without satisfying the ELM requirement.

Information about the ELM is mailed to all students subject to the requirement. This information is also available from the ELM/MAPE Office 805.756.2268, or online at: <http://www.math.calpoly.edu/elm>.

Early Start Program

The Early Start Program serves CSU admitted freshmen who have not demonstrated proficiency in written communication and/or mathematics/quantitative reasoning as determined by systemwide placement standards. Participation in the Early Start Program is required for students needing skills development in these areas; students will be expected to enroll in a written communication course or a mathematics/quantitative reasoning course (but not both) during the summer period prior to the start of the fall term. Students required to participate in the

Early Start Program may choose to enroll at any CSU campus; the earned credit will be transferred seamlessly to the student's destination campus.

The goals of the Early Start Program are to:

- Better prepare students in written communication and mathematics/quantitative reasoning before the start of the fall semester of the freshman year;
- Add an important and timely assessment tool in preparing students for college; and
- Improve the opportunity for students to successfully complete their college degrees.

Cal Poly Mathematics Placement Examination (MAPE)

The Cal Poly Mathematics Placement Exams are diagnostic exams given by the Mathematics Department to place students who have satisfied the ELM requirement in the appropriate college-level math course. **The MAPE is not intended for all students, so please read the following information carefully.**

Precalculus MAPE

Students who anticipate taking Trigonometry or Calculus (MATH 119, MATH 141, MATH 161, or MATH 221) must pass the precalculus MAPE unless they have presented proof of *one* of the following exemptions:

- a **new** SAT score of 620 or above on the mathematics section of the new SAT
- an **old** SAT score of 600 or above on the mathematics section of the old SAT Reasoning Test
- an SAT Subject Test score of 600 or above on the SAT Subject Test in Mathematics (level 1 or level 2)
- a score of 26 or above on the American College Testing (ACT) Mathematics Test
- a score of 3 or above on the College Board Advanced Placement Mathematics (Calculus AB or BC) examination
- completion of MATH 117 or MATH 118 at Cal Poly *or* transfer of a college course equivalent to MATH 118
- Transferable credit from another College/University in a course equivalent to MATH 118.

NOTE: *For MATH 141, students must also have credit for college or high school trigonometry, completed with grade C or better.*

Intermediate Algebra MAPE

Students who anticipate taking Precalculus Algebra (MATH 118) must pass the intermediate algebra MAPE unless they have presented proof of one of the following exemptions:

For **MATH 118:**

- a **new** SAT score of 570 or above on the mathematics section of the new SAT
- an **old** SAT score of 550 or above on the mathematics section of the old SAT Reasoning Test
- an SAT Subject Test score of 550 or above on the SAT Subject Test in Mathematics (level 1 or level 2)
- a score of 23 or above on the American College Testing (ACT) Mathematics Test; *or*
- a score of 65 or above on the ELM test.

NOTE: Students who have satisfied the ELM requirement and are planning to take MATH 112 or MATH 116 do not need to take the MAPE.

Students who need to take a math placement exam must do so prior to enrollment. The MAPE is free and offered regularly throughout the year. For information, please visit <http://math.calpoly.edu/mape> or contact the ELM/MAPE Office (805-756-2268).

Academic Standards

Academic Obligations

All students are expected to be diligent in the pursuit of their courses of study in order that both they and the State receive maximum benefit from the educational opportunities provided. Each student is responsible for his or her enrollments and timely adds, drops, and withdrawals following campus policy.

Students are expected to satisfy the academic demands required by their instructors in such ways as they may set forth, in order to satisfy the instructor that they are performing their assignments in a proper manner.

Instructors are expected to give first priority to meeting their scheduled classes and other assigned responsibilities, including keeping regular office hours for student conferences.

In classroom settings, instructors have the authority and responsibility to establish rules, maintain order, and to dismiss students from a class session for violation of the rules or misconduct. Violations or misconduct warranting more than a single dismissal from a class session should be referred by the instructor to the Office of Student Rights and Responsibilities at 805.756.2794 for disciplinary action.

Expected Academic Progress (EAP) Policy

Expected Academic Progress is defined as making appropriate degree progress each academic year by earning a certain percentage of degree applicable units that meet major, support, general education, concentration, and free elective (if applicable) requirements that are directly associated with the student's declared major.

Expected Academic Progress (EAP) is monitored for all undergraduate students each quarter. Students who fall behind in their EAP will be designated as having an **EAP deficiency** and may be required to meet with their academic advisor. Although this designation will not be noted on their transcript, students will be expected to make up this deficiency.

Those students who are required to meet with their advisor are expected to review and discuss their academic progress, and to create a reasonable academic plan to help get the student back on track. Attending summer session, either at Cal Poly, a community college, or another regionally accredited institution, may be suggested. Should the student decide to attend another institution, he or she must confirm that the courses they decide to take at that institution will apply to their Cal Poly degree requirements upon transfer.

If the student continues to have an EAP deficiency, their department or college **may have a hold placed on their registration for the next term or place them on Administrative Academic Probation (see the section on Administrative Academic Probation).**

Those students who have a demonstrated need to attend Cal Poly on a part-time basis for at least three consecutive quarters may be considered exempt from the EAP policy. These students will be required to submit an

EAP Exemption Request through their advisors in order to be evaluated for exemption.

In addition to the university's EAP policy, the College of Engineering has additional requirements. Please see the College of Engineering Advising Center for details.

I. Native EAP Policy (Students entering Cal Poly as first-time freshmen)

Every full-time undergraduate student is required to make reasonable academic progress toward completion of the bachelor's degree. EAP is monitored for all Cal Poly students in order to help them graduate in a timely manner.

Students entering Cal Poly as first-time freshmen and who are enrolled in four-year degree programs (e.g., BA, BS, BFA) are expected to graduate in twelve quarters. Normally, this will not include summer terms, as summer is considered an opportunity to make up for any lack of progress in prior quarters or to bank progress for future quarters.

To maintain Expected Academic Progress, the following standards should be met by the end of each respective year:

First year: Completion of at least **20%** of the total number of units required for the degree.

Second year: Completion of at least of **45%** of the total number of units required for the degree.

Third year: Completion of at least **75%** of the total number of units required for the degree.

Fourth year: Completion of at least **100%** of the total number units required for the degree.

Example: A student enrolled in a four-year degree program requiring 180 total units would need to complete no fewer than 36 units by the end of the first year, no fewer than 81 units by the end of the second year, no fewer than 135 by the end of the third year, and no fewer than 180 by the end of the fourth year.

To determine the standards for programs requiring more than 180 total units, multiply the total units required by .20, .45, .75, or 1.0 for each respective year. Students enrolled in a five-year degree (e.g., BArch, BLA) or blended programs must also demonstrate Expected Academic Progress and should consult with their major department for specific requirements.

Benchmark Courses: In addition to monitoring the number of required units completed, some departments may identify specific benchmark courses that should be completed by the end of each respective year. Students should check with their advisor for such requirements.

Degree Applicable Units: Departments rely on data derived from each student's Degree Progress Report (DPR) to verify that the expected number of units completed constitute degree-applicable units (units that advance the student toward degree completion). In tallying these units for the purpose of monitoring EAP, degree-applicable credits earned from Advanced Placement (AP), International Baccalaureate (IB), and accredited baccalaureate-level transfer work will be included.

Concentrations: If the student's major requires a concentration, units taken for the concentration are included in assessing EAP. The

concentration should be declared no later than reaching 90 units (junior standing).

Minors: Minors are optional at Cal Poly and are not a part of a student's EAP. Depending on the student's major, courses taken for the minor may or may not represent degree-applicable units (see "Maximum Units" below). Students who decide to pursue a minor should declare their minor no later than the end of their junior year. Minors must be completed within the EAP requirements identified (i.e., maximum number of units and quarters allowed for the degree). No minor will be awarded after the baccalaureate degree requirements have been met.

Maximum Units: Students graduating on time (this would be 12 quarters, excluding summers, for students enrolled in four-year degree programs) have no cap on the number of units they may complete at Cal Poly.

Students who do not graduate on time may complete no more than 24 Cal Poly units above the number required for the degree. Exceeding the allowable 24 units may result in a hold being placed on the student's registration or the student being placed on administrative academic probation. The student will be required to submit a **Degree Completion Plan** to the major department before he or she is allowed to continue their education at Cal Poly. The Degree Completion Plan may include only degree-applicable units, as the student will not be allowed to take non-degree-applicable classes during this period. In tallying the Maximum Units, *only Cal Poly units* will be included. Credit earned from AP, IB, and transfer work will not be used in the Maximum Units calculation.

Students contemplating a change of major or the addition of a second major should be aware that the maximum unit cap applies in these circumstances. As outlined in the Change of Major section elsewhere in the catalog, major changes should be undertaken only if the new major will not result in exceeding the maximum units cap of 24 Cal Poly units above the number required for the degree. The same holds true for a second major. In the case of a change of major, the cap would be 24 units above the number required for the new major. In the case of a second major, the cap would be 24 units above the minimum required for the primary major.

Failure to make reasonable academic progress as prescribed by this policy may result in a hold being placed on the student's registration or the student being placed on administrative-academic probation. Notification that a hold has been placed or being placed on administrative-academic probation will be sent to the student's Cal Poly email address. Continued failure to meet EAP standards may result in disqualification from the University.

Exemptions: Students who have to comply with an externally imposed set of degree progress standards (e.g., athletes following NCAA regulations) may continue to follow those guidelines. Other students for whom the Expected Academic Progress policy represents undue hardship may appeal for exemption through their advisors. Such appeals should be supported with documentation as appropriate (e.g., a physician's note).

II. Transfer EAP Policy

Every full-time undergraduate student is required to make reasonable academic progress toward completion of their bachelor's degree. EAP is monitored for all Cal Poly students in order to help them graduate in a timely manner.

Ideally, those who enter Cal Poly as upper division transfer students and who are enrolled in four-year degree programs (BA, BS, BFA) are expected to graduate in two years (six quarters). However, EAP policy does allow students three years (nine quarters, *excluding summer quarters*) to

complete their degree requirements at Cal Poly, should they still have remaining lower division requirements after they are admitted as junior transfers.

To maintain Expected Academic Progress, the following standards should be met by the end of the specified year of study at Cal Poly (note that these standards are based on the assumption that all upper division transfer students enter with at least 90 degree-applicable units and are General Education (GE) certified for lower division GE not specified by the major):

First year: Completion of at least **55%** of the total number of units required for the degree.

Second year: Completion of at least **80%** of the total number units required for the degree.

Third year: Completion of **100%** of the total number of units required for the degree.

Example: A transfer student enrolled in a four-year degree program requiring 180 total units would need to have completed no fewer than 99 degree-applicable units by the end of the first year, no fewer than 144 degree-applicable units by the end of the second year, and no fewer than 180 degree-applicable units by the end of the third year of study.

To determine the standards for programs requiring more than 180 total units, multiply the total units required by .55 or .80 or 1.0 for each respective year. Students enrolled in five-year degrees (e.g., BArch, BLA) or blended programs must also demonstrate Expected Academic Progress and should consult with their major department for specific requirements.

Benchmark Courses: In addition to monitoring the number of degree-applicable units completed, some departments may identify specific benchmark courses that should be completed by the end of each respective year. Students should check with their advisor for such requirements.

Degree Applicable Units: Departments rely on data derived from each student's Degree Progress Report (DPR) to verify that the minimum number of units completed constitute degree-applicable units (units that advance the student toward degree completion). In tallying these units for the purpose of monitoring satisfactory progress, degree-applicable credit earned from Advanced Placement (AP), International Baccalaureate (IB), and accredited baccalaureate level transfer work will be included.

Concentrations: If the student's major requires a concentration, units taken for the concentration are included in assessing the EAP. The concentration should be declared as soon as possible and no later than the end of the second quarter of study at Cal Poly.

Minors: Minors are optional at Cal Poly and are not a part of a student's Expected Academic Progress. Depending on the student's major, courses taken for the minor may or may not represent degree-applicable units (See "Maximum Units" below). Students electing a minor should declare the minor as soon as possible and no later than the end of the first year of study at Cal Poly. Minors must be completed within the EAP requirements identified (e.g., maximum number of units and quarters allowed for the major). No minor will be awarded after the baccalaureate degree requirements have been met

Maximum Units: Transfer students graduating on time (in 9 quarters, excluding summers, for transfer students enrolled in four-year degree

programs) have no cap on the number of units they may complete at Cal Poly. **Transfer students who are NOT on track to graduate on time may complete no more than 24 Cal Poly units above the number required for the degree.** Exceeding the allowable 24 units may result in a hold placed on the student's registration or the student being placed on administrative-academic probation. A **Degree Completion Plan** must be submitted to the major department before they will be allowed to continue their education at Cal Poly; such transfer students may enroll *only* in degree-applicable units. In tallying the Maximum Units, *only Cal Poly units* will be included. Credit earned from AP, IB, and transfer work will not be used in the Maximum Units calculation.

Students contemplating a change of major or the addition of a second major should be aware that the maximum unit cap applies in these circumstances. As outlined in the Change of Major section elsewhere in the catalog, major changes should be undertaken only if the new major will not result in exceeding the maximum units cap of 24 Cal Poly units above the number required for the degree. The same holds true for a second major. In the case of a change of major, the cap would be 24 units above the number required for the new major. In the case of a second major, the cap would be 24 units above the minimum required for the primary major.

Failure to make reasonable academic progress as prescribed by this policy may result in a hold being placed on the student's registration or the student being placed on administrative-academic probation. Notification that a hold has been placed or being placed on administrative-academic probation will be sent to the student's Cal Poly email address. Continued failure to meet EAP standards may result in disqualification from the University.

Exemptions: Students complying with an externally imposed set of degree progress standards (e.g., athletes following NCAA regulations) may continue to follow those guidelines. Other students for whom the Expected Academic Progress policy represents undue hardship may appeal for exemption through their advisors. Such appeals should be supported with documentation as appropriate (e.g., a physician's note).

Undergraduate Academic Probation and Disqualification

Core Values/Guiding Principles

Every student admitted to Cal Poly should have the maximum opportunity to earn a Cal Poly degree. As a university, we should be providing assistance and guidance wherever possible to achieve this goal. When students find themselves in academic difficulty, we should be creating pathways for success, preferably at Cal Poly. Our policies should reflect this premise as much as possible.

Definitions:

Academic Probation: The term grade point average (unadjusted for any subsequent grade forgiveness), Cal Poly cumulative grade point average, and/or higher education grade point average (GPA) drops below 2.000.

Academic Progress: The degree progress that students make by the end of each academic term by successfully completing units applicable to their declared major. Students' actual academic progress is displayed in the form of a "gauge" showing percent completed and is available on their student portal, in their Poly Profile under the Academic Progress section.

Academic Progress Level: At Cal Poly, students' academic degree progress is divided into four levels, denoting the progress that students

are expected make by the end of each of the 4 years that it takes to complete their degree (5 year degree programs have five levels). For detailed information, please see the Academic Standards (p. 48) section of the Cal Poly Catalog.

Academic Progress Level GPA Limits: The minimum GPA that students must attain in order to remain eligible to enroll at Cal Poly. The Academic Progress Level GPA Limits correspond to the Academic Progress Levels as outlined in the policy under Section II. Academic Disqualification.

Academic Success Contract: A set of academic conditions that students who are either in academic probation or administrative-academic probation status, or academic disqualification or administrative-academic disqualification status have to meet in order to remain eligible to enroll at Cal Poly.

Term Grade Point Average (Term GPA): The grade point average based on all graded work for the term (quarter).

Cal Poly Cumulative Grade Point Average (CPSLO GPA): The grade point average based on all graded work completed only at Cal Poly.

Higher Education Cumulative Grade Point Average (Higher Ed GPA): Grade point average based on all graded work completed at all colleges and universities including Cal Poly.

Disqualification: Academic status that may lead to dismissal.

Dismissal: Administrative action that prevents students from enrolling at Cal Poly for any future quarters. Dismissal may result from academic disqualification or administrative-academic disqualification status, or from a disciplinary proceeding. Dismissed students may or may not be allowed to return to Cal Poly, depending on the reason for the dismissal.

Reinstatement: Administrative action that restores students' eligibility to enroll at Cal Poly. Reinstatement may result from the approval of an appeal of disqualification or the removal of a disciplinary sanction.

Academic performance is considered in determining students' eligibility to remain enrolled. Uniform standards for academic probation/disqualification and for administrative-academic probation/disqualification are in effect at all campuses of the California State University. When they do not meet these standards, undergraduate students may be placed on academic probation and later placed on academic disqualification status or be placed on administrative-academic probation and later placed on administrative-academic disqualification status. Once placed on any disqualification status, students will be dismissed if no action is taken on behalf of the student, or if an appeal for continued enrollment is not approved by the university.

Undergraduate students are placed on academic probation or on academic disqualification status under the conditions stated below. For minimum academic standards applicable to graduate and post-baccalaureate students, see the Graduate Programs section of the catalog.

I. Academic Probation

Undergraduate students are automatically placed on academic probation when the current term grade point average (unadjusted for any subsequent grade forgiveness), Cal Poly cumulative grade point average, and/or higher education grade point average (GPA) drops below 2.000 (i.e., the equivalent of an average grade of C). Students are notified promptly via campus email by the Office of the Registrar if placed on

academic probation. Students are responsible for checking their campus email accounts regularly.

II. Academic Disqualification

Undergraduate students will be placed on academic disqualification status if their Cal Poly cumulative GPA (CPSLO GPA) or their higher education GPA (Higher Ed GPA) falls below the following academic progress level GPA limits based on the corresponding academic progress levels (degree applicable work completed):

Academic Progress Levels: Progress Level GPA Limits:	Academic
Academic Progress Level IV (75.1%-100%): Cumulative or Higher Ed GPA	1.950 Cal Poly
Academic Progress Level III (45.1%-75%): Cumulative or Higher Ed GPA	1.850 Cal Poly
Academic Progress Level II (20.1%-45%): Cumulative or Higher Ed GPA	1.700 Cal Poly
Academic Progress Level I (0%-20%): Cumulative or Higher Ed GPA	1.500 Cal Poly

New Student Success Clause: *To allow for an adjustment period, first-time freshmen and new transfer students will not be placed on academic disqualification status until the end of the first academic year even if their GPA falls below the designated academic progress level GPA limits.*

5-year programs: *Although the academic progress levels for the 5-year programs at Cal Poly differs from those of the 4-year programs, for the purposes of the academic disqualification policy, students in the 5-year programs are held to the same corresponding GPA levels as described above.*

III. Notice of Academic Disqualification

Students who fall into academic disqualification status will be notified via email from the Office of the Registrar before the beginning of the next quarter. Their academic status will also show on their student portal, in their Poly Profile. Failure to notify students does not create the right to continue enrollment.

Students will not be dismissed due to academic disqualification status at the end of the winter quarter. Those students who fall into academic disqualification status at the end of winter quarter will be placed on an academic success contract that, if successfully met, may result in permission to continue beyond spring quarter. However, students who are placed on an academic success contract at the end of fall quarter and who fail to meet the conditions of their contract will be dismissed at the end of winter quarter.

IV. Appeal for Reinstatement

Students who are in academic disqualification status may appeal for reinstatement. If reinstated, students will be placed on an academic success contract. Students who do not appeal for reinstatement or whose appeal is not approved will be dismissed from the university.

V. Administrative-Academic Probation

Undergraduate students may be placed on administrative-academic probation by action of the dean of the college in which the students' declared major resides for any of the following reasons:

2. Repeated failure to make Expected Academic Progress (as defined in the Academic Standards (p. 48) section of the Cal Poly Catalog) toward the stated degree or program objective when such failure appears to be due to circumstances within the control of the student.
3. Failure to comply, after due notice, with an academic requirement or regulation which is routine for all students or a defined group of students (for example, failure to complete a required CSU or campus examination, failure to complete a required practicum, failure to comply with professional standards appropriate to the field of study, failure to complete a specified number of units as a condition for receiving student financial aid or making satisfactory progress in the academic program).

When such action is taken, students are notified via campus email and are provided with the conditions for removal from probation and the circumstances that would lead to disqualification, should probation not be removed.

VI. Administrative-Academic Disqualification

Undergraduate students who have been placed on administrative-academic probation may be placed on disqualification status by action of the dean of the college in which the students are enrolled for any of the following reasons:

1. The conditions for removal of administrative-academic probation are not met within the period specified.
2. The student goes on academic probation while on administrative-academic probation.
3. The student is placed on administrative-academic probation more than once.

When such action is taken, the student is notified via campus email including an explanation of the basis for the action.

Academic Petitions

Academic petitions are handled through the Academic Affairs division of the University. The review process may include the academic department, academic advising offices, and/or college dean's office. Typical petitions include change of major, exceptions to academic requirements or policies, and admission/re-admission issues. Contact the appropriate office for specific academic petition procedures.

Admission and re-admission appeals are reviewed in the Admissions Office, and the University's final decisions are made there. Information on the admissions appeal process may be found on the Admissions Not Selected (<https://admissions.calpoly.edu/applicants/notselected.html>) webpage.

Academic Petition Appeals

Other academic petitions are typically reviewed at the department or program level as well as the college level. Petitions that are refused must first be appealed at the college level. Then, under limited circumstances, students may appeal to the Senior Vice Provost for Academic Programs and Planning or his/her designee. The right to this final appeal is not guaranteed; it is only considered if the student can show that one or more of the following exist:

1. Withdrawal from all or a substantial portion of courses in two successive terms or in any three terms. (Note: students who are on an approved leave of absence is not subject to administrative-academic probation for such withdrawal.)

1. A requirement or policy was incorrectly applied to the petition.
2. A requirement or policy is unclear or ambiguous.
3. There is new information that should be considered in the evaluation of the petition.
4. There are special circumstances warranting the granting of the appeal.

The granting of an academic petition appeal gives students the opportunity to present the merits of their petition to the Senior Vice Provost and his/her petition review team. The Senior Vice Provost's decisions regarding appeals represent the University's final decision on academic petitions. Contact the Office of Academic Programs and Planning at 805.756.2246 or at acadprog@calpoly.edu for more information on the procedures for filing an academic petition appeal.

Student Grievances

The University provides students with a variety of mechanisms to address student grievances or concerns. In all such matters, the University encourages students to attempt to resolve their grievances or concerns at the source of the issue (i.e., with the professor, department chair or administrator, or college associate dean). The Office of Student Rights and Responsibilities, at 805.756.2794 is available to any campus community member to assist with identifying and clarifying appropriate campus policies and procedures for addressing student grievances or concerns.

For general questions about grievances, contact the Office of Student Rights and Responsibilities, at 805.756.2794. The following list contains the offices or programs designated to address the more common student grievances at the University:

- **Grade Grievances** – The Fairness Board: Contact the Academic Senate Office, 805.756.1258 (See University Policies (p. 8) page for more detail on the functions of this Board)
- **Individual Student Misconduct** – Office of Student Rights and Responsibilities, 805.756.2794 (See Student Affairs (p. 427) page for more detail on the functions of this office)
- **Student Club Misconduct** – Office of Student Rights and Responsibilities, 805.756.2794 (See Student Affairs (p. 427) page for more detail on the functions of this office)

Eligibility for Intercollegiate Athletics

Eligibility for competition in intercollegiate athletics is regulated in general by the rules of the National Collegiate Athletic Association (NCAA), and specifically by current Conference and university regulations. The Director of Athletics is responsible for maintaining up-to-date intercollegiate athletics eligibility rules applicable to the University. The Faculty Athletic Representative has the responsibility for the interpretation of the NCAA, Conference, and university rules for determining student eligibility to represent the University in intercollegiate athletic events.

Eligibility for Student Activities

Students on either academic or disciplinary probation may not participate on intercollegiate teams nor may they hold positions of leadership in chartered student organizations or coded student government groups. Students on probation may participate in such student organizations and groups as members but they may not hold an office or represent

the University or the Associated Students, Incorporated in any official capacity.

Student Conduct and Discipline

It is expected that all Cal Poly students are enrolled for serious educational pursuits and that they conduct themselves so as to preserve an appropriate atmosphere of learning. It is also expected that all students who enroll at Cal Poly are willing to assume the responsibilities of citizenship in the campus community. Association in such a community is voluntary, and students may withdraw from it at any time that they consider the obligations of membership disproportionate to the benefits. While enrolled, students are subject to campus authority that includes the prerogative of dismissing those whose conduct is inimical to the aims of an institution of higher education.

While enrolled, students are subject to the regulations governing discipline stated in *Education Code* Section 66017 and in Title 5 of the *California Code of Regulations*, Sections 41301–41302, and to such rules and regulations as have been approved and promulgated by authority of the President. Copies of Title 5 California Code of Regulations 41301 and 41302, which deal specifically with student disciplinary regulations, are available to all students in the "Appendix" of this catalog. Other applicable regulations are contained in this Catalog, in the *Campus Administrative Policies*, the Standards for Student Conduct, Rights and Responsibilities, and in other official University publications, including the Cal Poly website.

Evaluation of Transfer Credit

Transfer Credit

The Evaluations Unit in the Office of the Registrar will evaluate previous college work and test credit in relation to Cal Poly degree requirements. Newly admitted and matriculated transfer students will receive an email from Evaluations that their evaluation has been completed and that the results are available in their Degree Progress Report (<https://registrar.calpoly.edu/degreeprogressreport>) via the Student Center on the Cal Poly Portal. New students cannot access their Degree Progress Report prior to that time, nor can Evaluations provide any specific information about credit prior to that time.

Every effort is made to provide a complete Degree Progress Report (DPR), with all transfer credit reflected, prior to the date of new transfer student registration in mid-August. The DPR serves as the basis for determining remaining degree requirements and should be used frequently to track progress toward the degree. More information about the Degree Progress Report can be found here:

<https://registrar.calpoly.edu/degreeprogressreport>.

While every effort is made to complete the evaluation according to the timelines outlined above, it is important that new transfer students review their previous college work in relation to the degree requirements outlined in the catalog in order to make a tentative selection of courses for their first quarter of enrollment. Students should consult their college advising center or a faculty advisor in their major department for assistance in the selection of courses. They should also use the "By Major" agreements on www.assist.org (<http://www.assist.org/web-assist/welcome.html>) for assistance with work from California Community Colleges.

Sending final transcripts as early as possible helps expedite the process of finalizing the transfer evaluation. A delay in receipt of final transcripts will postpone the finalization of the transfer evaluation.

Some major/support courses may need to be petitioned through the student's major department if articulation agreements are not in place in ASSIST, or if classes were taken at a private institution, at a University of California campus, or an out-of-state school. Every effort is made to extend all appropriate credit, including honoring the GE pattern of the transfer institution where possible.

Note: Transfer students with Advanced Placement or International Baccalaureate credit must have their scores sent to Cal Poly directly from the College Board or IB; notation of AP or IB exams on a college transcript is not sufficient for Cal Poly to award credit. Students should do this as soon as possible, in order for the transfer evaluation to be complete and accurate, and in order to satisfy registration prerequisites.

Semester units transferred to Cal Poly are converted to quarter units by multiplying the semester units by 1.5; a 3-unit semester class will equate to 4.5 Cal Poly units. If the Cal Poly requirement is 4 units, the excess 0.5 unit will count toward free electives.

The evaluation remains valid provided that the student matriculates for the term they are admitted remains in their declared major, and remains in continuous attendance.

While students may follow the specific academic program requirements for the catalog year on which their initial evaluation of transfer credit is based, they are responsible for complying with any and all changes in other regulations, policies, and procedures, which may appear in subsequent catalogs, or which are communicated to them via email from the Office of the Registrar. These include CSU-mandated changes and changes approved by Cal Poly's Academic Senate and/or administration.

Credit for Community College Courses

Course credit earned at regionally accredited community colleges is evaluated by the Evaluations Unit in accordance with the following provisions:

- Community college credit is allowed up to a maximum of 105 quarter units (70 semester units) toward overall units for the degree. Credits earned above this allowable maximum may still be used to satisfy specific subject and grade point requirements, but may not be applied toward the total count of units required for graduation (Example: a student in a 180-unit program, who has 110 quarter units of community college credit, all of which satisfies subject requirements, must still complete **75** units of non-community college work [not 70 units]).
- Upper division credit is never granted for community college work.
- The 105-unit limit does not apply to work from four-year institutions; however, specific course requirements, as well as Cal Poly residency requirements, must still be met regardless of the number of units transferred from four-year institutions (see "Academic Residence Requirements" under "Minimum Requirements for Graduation").

Cal Poly maintains articulation agreements at www.assist.org (<http://www.assist.org/web-assist/welcome.html>) with all California Community Colleges (CCC), the California State University (CSU) and University of California (UC) campuses. The CCC campuses publish the CSU General Education (GE), the Intersegmental General Education Transfer Core

(IGETC) course lists, and the lists of CSU transferable courses on the ASSIST website.

Transfer credit for GE courses is accepted from California institutions, as approved by the CSU Chancellor's office. The GE Area letters and numbers at Cal Poly (e.g., A1, D4) may be different from other colleges; for help in understanding these differences, please refer to <https://registrar.calpoly.edu/degree-progress-report-guide>.

Note: GE certification, whereby transfer students can complete all lower-division GE at a CCC or CSU, does not exempt students from meeting the CSU requirement of 72 overall units of GE, nor from completing upper-division GE requirements. Many Cal Poly programs require specific GE courses in the Major and/or Support; these courses must be met with articulated equivalencies. See the General Education (p. 32) page for General Education requirements.

Submitting a CSU GE certification form is not required; Evaluations will use assist.org and/or the catalog, to determine GE certification. Submitting an IGETC certification, if the student is IGETC certified, is highly encouraged. Note: if a CCC GE certification is incorrect, it will not be honored (i.e., if it applies work from a previous institution in an inappropriate manner). As the institution granting the bachelor's degree, Cal Poly will make the final determination of GE certification.

Other Academic Credit

Advanced Placement (AP) Credit

Cal Poly grants credit for AP exams successfully completed through the College Board AP program. AP scores may be requested from Educational Testing Service (ETS)/AP Programs and should be sent to Cal Poly electronically. *To request scores:* ETS/AP Program, PO Box 6671, Princeton, NJ 08541-6671 or 609.771.7300. Cal Poly cannot accept paper score reports which have been opened by the student. Notation of Advanced Placement on high school transcripts is not sufficient; official scores must be requested from ETS.

Exams passed with a score of 3 or higher result in nine (9) quarter units of credit, except where otherwise noted on the credit matrix. All credit is given on a credit/no credit basis; AP units do not calculate into the GPA. Credit may vary from year to year, as Cal Poly requirements and AP Exams change. AP credit matrices, published annually in April, are available at: https://registrar.calpoly.edu/other_ac_credit

Please refer to the matrix for the **specific** year the exam was taken; credit is always extended based on the year of the exam. To determine credit for combined exams, use the matrix for the year of the last exam taken.

Admitted students should send their AP scores as soon as possible to ensure that credit is applied toward their fall schedule.

International Baccalaureate (IB) Exam Credit

The International Baccalaureate Diploma shall be considered in lieu of a high school diploma for admission to the University.

The International Baccalaureate **transcript** is required to receive University credit; the diploma is not sufficient to receive credit. IB transcripts may be requested from IB North America by email: transcripts.ibna@ibo.org, or by phone: (212) 696-4464.

Credit is awarded for classes at the **Higher** level. No credit is extended for Standard level exams.

All credit is given on a credit/no credit basis; IB units do not calculate into the GPA.

For each Higher Level exam score of 5 or higher, a maximum of 8 units of credit is awarded.

IB credit matrices, published annually in April, are available at: https://registrar.calpoly.edu/other_ac_credit. Please refer to the matrix for the **specific** year the exam was taken; credit is always extended based on the year of the exam.

Credit for Non-collegiate Instruction

Cal Poly grants undergraduate degree credit for successful completion of non-collegiate instruction, either military or civilian, appropriate to the baccalaureate degree, which has been recommended by the Commission on Educational Credit and Credentials of the American Council on Education. The number of units allowed are those recommended in the Guide to the Evaluation of Educational Experience in the Armed Services and the National Guide to Educational Credit for Training Programs.

Credit for Military Service

Nine quarter units of elective credit are allowed toward graduation to any student submitting evidence of satisfactory completion of basic training in the military service of the United States. 4 units satisfy GE Area D4 (CSU, GE Area E), and 5 units are elective credit (Cal Poly requires the DD-214 form to extend credit). Credit is allowed in accordance with the recommendations by the Commission on Educational Credit and Credentials of the American Council on Education. The numbers of units allowed are those recommended in the *Guide to the Evaluation of Educational Experience in the Armed Services*. Credit is not given for college level General Educational Development Tests. Military Service credit does not calculate into the GPA. Military Service credit is not included in scholarship computations.

CLEP Exam Credit

Cal Poly grants credit to those students who pass examinations that have been approved for credit systemwide. These include some College Level Examination Program (CLEP) examinations.

CLEP tests acceptable for credit are:

- College Algebra-Trigonometry with a passing score of 50;
- Pre-Calculus with a passing score of 50;
- General Chemistry with a passing score of 50;
- Calculus with Elementary Functions with a passing score of 51.

4.5 quarter units of credit may be earned with an assigned grade of credit (CR), which is not included in the GPA calculation.

Credit for CLEP and other externally developed examinations is *not* awarded if any of the following apply:

- examination previously taken within the past year;
- equivalent degree credit or duplicate credit has already been granted;
- credit has been granted for previous coursework or for a previously completed more advanced or higher level examination.

Credit by Examination (Challenging Cal Poly Courses)

A student may challenge a course in which he or she is qualified through previous education by taking an examination developed at the campus. Credit shall be awarded to those who pass this examination successfully. A student may not petition for credit by examination if the student has

ever been enrolled in the course. Credit shall not be awarded when credit has been granted at a level more advanced than that represented by the course being challenged.

The credit by examination option is only available to admitted Cal Poly students during a term in which they are officially enrolled. A fee is charged for such each credit by exam petition.

The examination may include written, oral, or skills tests, or a combination of all three types, and is sufficiently comprehensive to determine that the student has essentially the same knowledge and skills as those students who successfully complete the course. The length of the examination is consistent with the unit value of the course.

Arrangements to obtain course credit by exam may be made with the head of the department in which the course is taught. Not all Cal Poly courses are available or appropriate for credit by exam. Units of credit received through this procedure do not apply toward the residence requirements or the Cal Poly GPA for any of the degrees or credentials offered by the University. Detailed instruction for applying for credit by examination may be obtained from the Office of the Registrar.

Grading

A grade may be changed for the purpose of correcting clerical or administrative error, or to correct an error in the calculation or recording of a grade. A change of grade shall not occur as a result of additional work performed or reexamination beyond the established course requirements (Academic Senate Resolution AS-384-92).

Units Earned are all hours for which credit was earned (excludes grades of F, WU, and NC. F and WU grades affect the GPA; NC grades do not affect the GPA).

Units Graded carry grade point value (excludes grades of CR and NC, which have no effect on GPA).

Grade Points are awarded for each course unit and are determined by multiplying course unit(s) by the grade point value of the grade.

Grade Point Average (GPA) is determined by dividing Grade Points by Units Graded.

Higher Education GPA is the grade point average of all college level work, both Cal Poly and any transfer work.

Transcripts are the official record of academic history. Once a degree has been awarded, subsequent revision and alteration of any transcript entry is permitted only for correction of proven error as certified by the appropriate academic dean and the Registrar. No changes are made to the academic record after 60 days following the awarding of the degree.

Grading Symbols

Academic Grading Symbols Earned

Symbol	Definition	Grade Points Earned Per Unit
A	Superior Attainment of Course Objectives	4.0
A-	Superior Attainment of Course Objectives	3.7
B+	Good Attainment of Course Objectives	3.3

B	Good Attainment of Course Objectives	3.0
B-	Good Attainment of Course Objectives	2.7
C+	Acceptable Attainment of Course Objectives	2.3
C	Acceptable Attainment of Course Objectives	2.0
C*	Acceptable Attainment of Course Objectives	1.7
D+	Poor Attainment of Course Objectives	1.3
D	Poor Attainment of Course Objectives	1.0
D-	Poor Attainment of Course Objectives	0.7
F	Non-Attainment of Course Objectives	0.0
CR	Credit (No effect on GPA)	-
NC	No Credit (No effect on GPA)	-

* Certain sequenced courses may have a C– prerequisite for advancement.

Credit/No Credit Grading

Some courses, as indicated in their catalog descriptions, are offered on a Credit/No Credit grading basis only. The following conditions apply when a student elects to take for Credit/No Credit grading those courses that are not designated by the University as being graded on an exclusive Credit/No Credit basis.

1. Students desiring to elect a course on a Credit/No Credit grading basis must be currently enrolled in the course and must elect the Credit/No Credit grading option through the registration system. This request can be made through the 8th day of the quarter. Students may **not** change from one grading system to the other after the end of the 8th day of the term.
2. Undergraduate students are given a grade of CR for accomplishment equivalent to a grade of C– or better. No credit (NC) is given for D + or lower grades. Graduate students receive a grade of CR that is based on an evaluated grade of B– or higher and NC for assigned grades of C+ or lower. Instructors submit conventional letter grades to the Registrar's Office where they are converted to Credit/No Credit grades. **NOTE: Some post-baccalaureate programs penalize students for a grade of CR; students should carefully consider the implications of selecting CR/NC grading.**
3. The applicant for a Credit/No Credit grade must have at least a 2.0 grade point average in cumulative Cal Poly work. This requirement is waived for first-time students.
4. No more than two courses may be selected for Credit/ No Credit grading in any term.
5. Units earned in courses for which the grade was CR count toward satisfaction of all degree requirements, if the student is within the guidelines listed in Item 6.
6. Undergraduate students may elect a maximum of 16 units of Credit/ No Credit grading. Up to 4 units of Credit/No Credit grading is allowed in major or support courses, if allowed by the student's major department (see the Degree Requirements and Curriculum for each major to determine if Credit/No Credit grading is allowed). Up to 4 units (or one course, if the course is a five-unit course, e.g., CHEM 111) of Credit/No Credit grading is allowed in General Education courses (those GE courses which are required for the bachelor's degree). The remainder can be taken as free electives. These unit maximums apply to the **selection** of credit/no credit grading basis, regardless whether a student earns a grade of CR or NC.
7. Credit/No Credit grading is removed for courses not meeting the above guidelines; the grade is changed to the letter grade assigned

by the instructor. Students are strongly encouraged to verify, before enrolling, whether they are allowed to select Credit/No Credit grading for a particular course or requirement.

8. Non-matriculated students, including those in the Extension Program, Summer Session, and Workshops must meet the same requirements as matriculated students to elect courses on a Credit/No Credit grading basis. (The 2.0 GPA requirement is waived in the case of non-matriculated students having no previous coursework recorded at Cal Poly.)

Administrative Grading Symbols

Symbol	Definition	Grade Points Earned Per Unit
AU	Audit	-
I	Incomplete (authorized)	-
RD	Report Delayed	-
RP	Report in Progress	-
W	Withdrawn	-
WU	Withdrawal Unauthorized	0

Audit

An auditor is a student who attends a course and receives no credit for the course. Enrollment as an auditor is subject to permission of the instructor. Enrollment in a course as an auditor shall be permitted only after students otherwise eligible to enroll on a credit basis have had an opportunity to do so.

Auditors are subject to the same fee structure as credit students, and regular class attendance is expected. Once enrolled as an auditor, a student may not change to credit status unless such a change is requested prior to the last day to add classes. Courses enrolled in with audit grades are not considered when determining enrollment status (for financial aid and other purposes).

An instructor is authorized to submit a change-of-grade form to change an AU to NC for students who audit a class but do not attend or do not meet agreed-upon criteria.

The student services fee and nonresident tuition fee are determined on the basis of the total units for which the student is enrolled including courses audited.

Incomplete (Authorized)

An Incomplete signifies that a portion of required coursework has not been completed and evaluated in the prescribed time period due to unforeseen but fully justified reasons and that there is still a possibility of earning credit. It is the student's responsibility to bring pertinent information to the instructor who determines the means by which the remaining course requirements are satisfied. A final grade is assigned when the work agreed upon has been completed and evaluated. The student is not permitted to re-enroll in the course to complete course requirements. If the student does re-enroll, the original grade of I is counted as an F (or NC) and the re-enrollment is processed as a repeated course.

The instructor designates terms of the contract and length of time allowed to complete work, not to exceed one year. Failure to complete the assigned work results in the I being counted as equivalent to an F (or

NC) for grade point average computation. All remaining grades of I are changed to F (or NC) at the time the student's degree is awarded.

Withdrawal Unauthorized

The symbol "WU" indicates that an enrolled student did not withdraw from the course and also failed to complete course requirements. It is used when, in the opinion of the instructor, completed assignments or course activities or both were insufficient to make normal evaluation of academic performance possible. For purposes of grade point average and progress point computation, this symbol is equivalent to an "F".

Report In Progress

The "RP" symbol is used in connection with courses that extend beyond one academic term. It indicates that work is in progress but that assignment of a final grade must await completion of additional work. Work is to be completed within one year except for graduate degree theses, which have a seven-year time limit. Students should not re-enroll in the course to complete course requirements; they should instead work with the instructor to complete the additional work.

Re-enrollment is only permitted in instances of repeatable courses. Cumulative enrollment in units attempted may not exceed the total number applicable to the student's educational objective. Work is to be completed within a stipulated time period.

The RP symbol shall be replaced with the appropriate final grade within one year or the grade is converted to an F, except that grades of RP for graduate degree theses (courses numbered 539/596/598/599) convert to a grade of No Credit (NC) if a final grade has not been assigned within seven years. All remaining RP grade symbols are changed to F or NC at the time the student's degree is awarded.

Repeating a Course

Undergraduate students cannot repeat courses in which they have earned a C or better grade (C- can be repeated).

Course Repeats with Grade Forgiveness

Undergraduate students may repeat a maximum of 16 units at Cal Poly for purposes of improving their GPA. Grades of C- or lower are eligible for grade forgiveness.

- If the second Cal Poly grade is equal to or higher than the first, then it replaces the first grade. The original grade is "forgiven" from the GPA computation, but both grades appear on the student's transcript.
- If a course that was originally taken for a letter grade is re-taken with *credit/no credit grading*, the original grade is not excluded from the GPA.
- Grade forgiveness does not apply if the second grade is lower than the first grade. In this case, both grades are averaged into the student's GPA.
- Effective Summer 2007, grade forgiveness can be applied to the same course only once. Any additional attempts will be averaged into the GPA.
- Courses subsequently repeated at another institution and transferred back to Cal Poly are not eligible for forgiveness.
- Grade forgiveness shall not be applicable to courses for which the original grade was the result of a finding of academic dishonesty.

With the exception of the reasons listed below, the repeat adjustment is made automatically at the end of the term in which the course is repeated. A repeat petition is required for the following reasons only:

- the course was originally taken at Cal Poly before Fall 1987
- the course was originally taken at another institution
- the course has changed prefix or number
- the courses are considered similar in content but are not identical (e.g., STAT 217/STAT 218)

Repeat Petitions for Grade Forgiveness for the situations listed above must be turned in to the Office of the Registrar by the end of the seventh week of the quarter in which the course is repeated.

Course Repeats with Grades Averaged

Students may repeat an additional 18 units in addition to the 16 units for which grade forgiveness is permitted. Once the 16 unit forgiveness limit is reached, the grade from the repeat attempt shall not replace the original grade; instead both grades shall be calculated into the overall GPA.

Once students accumulate 34 units (16 units with forgiveness + 18 units with averaging) of repeated courses, they will no longer be allowed to repeat any future courses.

Withdrawals / Renewal

The W grading symbol indicates that the student was permitted to withdraw from the course after the regular add/drop period with the approval of the appropriate campus officials. It carries no adverse connotation of quality of student performance and is not used in calculating grade point averages.

Between the end of the regular add/drop period and the end of the seventh week of instruction a student must request permission to withdraw from a course by processing a petition that is available at the Office of the Registrar. The petition is approved and withdrawal authorized only if there are serious and compelling reasons for withdrawal in the judgment of the department head.

The withdrawal petition also requires the signature of the course instructor and the student's academic advisor.

Between the end of the 7th week of instruction and the last day of instruction, withdrawals are permitted only if the withdrawal is based on an emergency situation clearly beyond the control of the student. In such cases a final or incomplete grade may be assigned for courses in which sufficient work has been completed to permit an evaluation to be made. The student must request permission to withdraw as specified above, or request grade assignment, both of which are subject to approval by designated campus officials. Any student who fails to provide notification or who fails to obtain formal approval to withdraw is subject to failing grades (WU, F, or NC).

Undergraduate students may withdraw from no more than 28 quarter units.

Cancellation of Registration or Withdrawal from the Term

Students who find it necessary to cancel their registration or to withdraw from all classes after enrolling for any academic term are required to follow the University's official withdrawal procedures. Failure to follow formal University procedures may result in an obligation to pay fees

as well as the assignment of failing grades in all courses and the need to apply for readmission before being permitted to enroll in another academic term.

Students may drop their classes on their Student Center all the way through the add/drop period, until the end of the 8th day of the term. Grades are not assigned for courses dropped during this period.

With the approval of campus officials, a student is permitted to withdraw from all classes for the quarter for serious and compelling reasons until the end of the 7th week of instruction. After the 7th week and through the last day of instruction, withdrawals for the term must be based on an emergency situation clearly beyond the control of the student, and approved by campus officials.

The student is required to initiate a request for a term withdrawal with the Registrar and to complete required exit procedures. If the student is unable to appear in person, he/she may write or call the Office of the Registrar, 805.756.2531, to request withdrawal. The request must specify reasons for leaving the institution and include the student's signature. The date of the withdrawal is established according to the guidelines contained in the institutional policies governing term withdrawals or as determined by the Registrar.

The student may be eligible for a full or partial refund of registration fees depending upon the time and circumstances of withdrawal. If eligible for a refund, the refund remains in the student's account on campus, unless the student files a written application for the refund to be sent to the student. Fee refund policy information is available at <https://afd.calpoly.edu/fees/>.

Students who receive financial aid funds must consult with the Financial Aid and Student Account Offices prior to withdrawing from the University regarding any refunds or repayments of grant or loan assistance received for that academic term. If a Title IV financial aid recipient withdraws from the University during a payment period, the grant or loan assistance received is subject to federal refund and repayment provisions.

Withdrawal from Previous Terms

A student may petition to have all grades retroactively changed to the administrative grade of "W" if he/she can demonstrate and document that there were serious and compelling reasons or circumstances that resulted in the unofficial withdrawal for the quarter in question. A student may not retroactively withdraw from selected courses during a particular quarter, but must petition to withdraw from the entire quarter. **The petition must be submitted within one year following the end of the term.** Refunds of registration fees are not available for withdrawals following the last day of instruction. For more information, contact the Office of the Registrar.

Academic Renewal

The Trustees of the California State University have established a program of Academic Renewal whereby students who are having difficulty meeting graduation requirements due to a grade point deficiency may petition to have up to two semesters or three quarters of previous undergraduate coursework discounted from all considerations associated with meeting requirements for the baccalaureate degree. None of the courses taken in such terms can be applied toward the degree.

Academic Renewal, as defined by campus policy, is processed only at the point of graduation. Academic Renewal is intended only to enable graduation from Cal Poly and is not available for individuals who already

possess a baccalaureate degree or who meet graduation requirements without the approval of a petition for Academic Renewal.

Conditions: In order to qualify for Academic Renewal all of the following conditions established by the Trustees must be met:

1. Five years must have elapsed since the term or terms to be disregarded were completed. The terms to be disregarded may have been taken at any institution.
2. Since completion of the term(s) to be disregarded, the student must have completed coursework at Cal Poly of at least one of the following:
 - 22 units with a minimum GPA of 3.00,
 - 45 units with a minimum GPA of 2.50,
 - 67 units with a minimum GPA of 2.00
3. The student must present evidence that the coursework to be disregarded was substandard and not representative of the student's present scholastic ability and level of performance.

Final determination, that one or more terms shall be disregarded, shall be based on careful review of evidence by a committee appointed by the President, which shall include the designee of the chief academic officer and consist of at least three members (E.O. 1037).

For additional information about Academic Renewal, contact the Evaluations Unit of the Office of the Registrar.

Other Academic Policies

Academic Honors

The **Dean's Honors List** is compiled at the end of each quarter to honor undergraduate students who have completed 12 or more letter-graded units during the quarter with a 3.5 grade point average or better for that term. Units with a grade of CR do not count toward the 12-unit minimum, nor do units from Credit by Examination. **The President's Honors List** is compiled at the end of each university year to honor those undergraduate students who have demonstrated consistent achievement, as represented by being named to the Dean's Honors List for any three of the four quarters of the university year. Note that the university year begins with summer quarter.

Candidates for bachelor's degrees with the following **Cal Poly cumulative grade point averages** are awarded honors at graduation. **Only courses taken at Cal Poly calculate into the Cal Poly grade point averages.** The GPA is officially calculated at the time the student has *completed* graduation requirements:

Summa cum laude – 3.850
 Magna cum laude – 3.700
 Cum laude – 3.500

These honors are noted on both the diploma and the transcript.

Academic Minors

A minor is an integrated, coherent group of courses (24 to 30 quarter units), which gives the student knowledge in an area that lies outside of the major field of study. Please see Programs A-Z (<http://catalog.calpoly.edu/programsaz>) for the list of minors.

Requirements for the minor:

- At least half of the units must be from upper-division courses (300- or 400-level)
- At least half of the units must be taken at Cal Poly (in residence). For the French, German, and Spanish minors, the requirement for students studying abroad is at least one third of the units must be taken at Cal Poly; this allowance is for study abroad programs only and does not apply to any domestic transfer credit.
- Not more than one-third of the courses in a minor can be graded with student-selected Credit/No Credit (CR/NC), except for courses that have mandatory CR/NC grading
- A minimum 2.0 GPA is required in all units counted for completion of the minor

The minor must be completed prior to, or at the same time as, the requirements for the bachelor's degree. A major and a minor may not be taken in the same degree program, and a minor is not required for a degree.

Students who wish to earn a minor should contact the department offering the academic minor as early as possible in the program and fill out the appropriate agreement form. Students may select a minor which has requirements from a catalog that is different from that of their major. The minor form must then be submitted to the Office of the Registrar. The completion of the minor is noted on the student's transcript, but is not shown on the diploma. In no case is a diploma awarded for the minor.

Blended BS+MS Programs

Blended programs can provide an accelerated route to a graduate professional degree, with simultaneous awarding of both bachelor's and master's degrees. See individual programs and the Graduate Education (p. 412) section for additional information.

Change of Major Policy Statement

Because of the impact of the campus and its programs, Cal Poly students must declare a major at the time of application. After making this decision, some students may find that their interests and abilities lead them in a different direction. The university must then offer a transparent and timely process for students to change majors and successfully complete a degree program.

General Information

Entering students are encouraged to make careful and informed decisions about their majors. All majors at Cal Poly are impacted, and it may be difficult to change majors despite students' best efforts. If students decide to change majors, doing so early in their academic career will help students make degree progress in a timely manner. This is likely to be a greater challenge for upper-division students (more than 90 units completed), including transfer students, who have fewer remaining degree requirements. Furthermore, students need to be aware that not all departments can accommodate an upper-division change of major.

Policy Standards

I. Minimum Time at Cal Poly

Students must complete at least one quarter at Cal Poly before requesting a change of major. The major exploration process can begin in their first quarter, but no official change of major may be initiated at that time.

II. Basic Criteria

In determining standards for major changes, a department representative may consider the following criteria when considering students' requests:

- Eligibility for the proposed major at the time of admission.
- Academic record (e.g. GPA, coursework, etc.).
- Ability to complete degree requirements in the new major in a timely manner.

If students meet the basic criteria for the proposed major, an Individualized Change of Major Agreement (ICMA) may be initiated by a department representative of the proposed major.

III. One Request Per Major

Students who enter into a change of major agreement and do not complete the agreement's requirements, either by failing to complete the terms or by opting out due to a change of plan or interest, will *not* be eligible to request that same major again later in their career at Cal Poly.

IV. Academic Standing

A change of major agreement can be initiated while students are on Academic Probation (AP), if the department offering the intended major believes that the AP status is due to students being in a less suitable major and that the new major represents a viable path toward good academic standing. A change of major agreement will be void if the students are academically disqualified prior to the completion of the agreement.

V. Requesting a Change of Major

To begin the formal change of major process, students must log into the Change of Major portlet located on the Academics tab at my.calpoly.edu. More information is available at advising.calpoly.edu.

VI. Individualized Change of Major Agreement

- The change of major may be approved immediately, completed within one quarter, or completed within a maximum of two quarters.
- The ICMA includes the following conditions:
 - Students cannot be required to take courses before the ICMA begins.
 - Students cannot be required to take courses that are outside of the ICMA.
 - Students cannot be required to enroll in more than three specified courses or 12 units in the new major curriculum during the ICMA process.
 - Students should balance their schedule with General Education (GE) or other courses that may apply to both majors.
 - Students' GPA requirements may include minimum GPA in courses specified in the ICMA, Term GPA, Cal Poly SLO GPA, or Higher Ed GPA.
 - Students' GPA expectation(s) established by the department representative must be attainable.

Course Substitution

Although a curriculum is specified for each major, under certain conditions a student may be permitted some deviation from the

established curriculum. See the major department for substitutions involving major or support courses.

All Cal Poly students are expected to complete the GE courses specified in their degree program. Cal Poly GE courses must be selected from the GE requirement list. Substitutions are not permitted except in extraordinary circumstances. Students requesting exceptions must follow petition procedures, outlined on the GE web site. This process may take several weeks.

Double Majors or Degrees

If a student has completed the requirements for two or more majors leading to the same baccalaureate degree (e.g., two BS degrees), those majors are acknowledged on a single diploma. The major which the student requests as her/his **primary** major will appear first on the diploma. If a student has completed the requirements for two or more majors leading to different baccalaureate degrees (e.g., a BS and a BA), those degrees and the completed major or majors leading to each degree are acknowledged on two separate diplomas. If a student has completed concurrently the requirements for two or more degrees, at least one of which is a graduate degree, Cal Poly issues a separate diploma for each degree earned.

A student who adds a second major to her/his degree objective is expected to fulfill all requirements for both majors. However, a student may be allowed to use one senior project to fulfill the requirements for two majors. The program in which the student seeks to replace the senior project must grant permission before the student begins the project. Permission must be obtained using a major/support substitution.

Students who have declared two majors will be awarded both degrees for the term in which all requirements are completed for both majors.

Final Examinations

Except in specific circumstances, final assessments are administered during the scheduled finals week. If the assessment is a final exam, faculty will include the date and time of the exam on the course syllabus and, whenever applicable, provide students with advance notice if the final exam date is not available at the start of the term or has been rescheduled with the written approval of the appropriate dean.

If a student has three or more final exams on the same day, faculty should make a reasonable effort to schedule an alternative final exam for that student during the finals week. It is the student's responsibility to notify an instructor to request to reschedule a final exam by the end of the seventh week of instruction.

Graduate Courses Taken by Undergraduates for Graduate Credit

Cal Poly undergraduates who have achieved senior standing may take courses in the 400 or 500 series for possible graduate credit while still undergraduates. If they subsequently enter a Cal Poly master's or credential program, they may petition to have up to 12 units of such course credit applied toward their master's degree or credential program, **if** the units were not used in any way for the baccalaureate degree. Such courses should be noted in the appropriate section of the Formal Study Plan.

Student Classification/Standing

Undergraduate students are assigned a classification level according to the number of quarter units earned:

Lower Division

Freshman fewer than 45 units
Sophomore..... 45 to 89 units

Upper Division

Junior 90 to 134 units
Senior..... 135 or more units

For the purposes of this calculation, earned units include transfer and Advanced Placement credit, in addition to Cal Poly units. Note that Student Standing can differ from Academic Progress levels; the Academic Progress calculation takes into account only degree-applicable units, whereas Student Standing includes all earned units, whether they apply to the degree or not.

Registration

Students are required to enroll in courses through their Student Center. The courses selected should meet the requirements specified for each student's major course of study.

Credit for coursework completed is given only when the student is properly registered. A student is not properly registered until fee requirements have been met and enrollment in classes has been confirmed in their Student Center. **Students are strongly advised to print copies of their schedule for their records.** Individuals are not permitted to attend courses unless they are officially registered as regular students, as approved extension students, or as enrolled auditors (see Audit).

Information concerning registration for classes is available at <https://registrar.calpoly.edu/registration-overview>. Information concerning payment of fees is available at <http://fees.calpoly.edu/>.

Enrollment Policy

State funding is allocated to the University based on student enrollment each term. Any attendance/participation in classes where the student is not officially enrolled during the term of participation (and where appropriate registration fees have not been paid) is against campus policy. This includes enrollment in Internship courses and acceptance of a position through the Cooperative Education program. All registration should be completed by the end of the Add Period, the 8th day of instruction for each term.

Official term enrollment requires the awarding of grades for classes attempted.

Class Attendance

Students are expected to attend class regularly to keep the quality and quantity of their work high. Absence from classes is regarded as serious. An excused absence can be allowed only by the instructor in charge of the class upon consideration of the evidence justifying the absence presented by the student. An excused absence merely gives the individual who missed the class an opportunity to make up the work and in no way excuses the student from the work required.

"Excusable" Reasons for Missing Class

It is strongly urged that instructors accept the following "excusable" reasons for allowing students to make up missed work:

- Illness with a doctor's statement
- Serious illness or death of close relatives
- Active participation in university events (an instructor may require a statement from the adviser involved certifying that the student was actively participating in a recognized university event)
- Field trips
- Religious holidays
- Selective service and military reasons
- NCAA athletic competitions
- Instructionally Related Activities (IRA)/competitions
- Jury duty or any other legally required court appearances
- Job or internship interviews

Any student seeking to make up missed work pursuant to the above listed "excusable" reasons must inform the instructor of their intent in a timely manner.

Holding of Records

Student records may be placed on a "Hold" status because of financial or other obligations to the University. The Hold authorizes the University to deny registration, prevent the release of transcripts, and to withhold other services normally provided to the student. A student's records are held until the obligation is cleared to the satisfaction of the office or department placing the Hold.

Enrollment Status

Full-time undergraduate students are those enrolled in 12 or more units of coursework in any regular quarter. *Half-time undergraduate students* are those enrolled in 6 to 11 units, and part-time undergraduate students are those enrolled for 5 or less units. Verification of enrolled units is based on enrollment status at the time of the verification request. Full-time status for graduate students is defined in the "Graduate Studies" section of this catalog.

Maximum Unit Load

The maximum load for all students is 22 quarter units including audited courses. Exceptions may be made with the advance approval of the student's major department head or graduate advisor. Increase in maximum unit load is not available to students on academic probation. Maximum load requirements may be waived only on presentation of evidence of ability to carry successfully such a group of courses. A petition to carry an excess load is available from the Office of the Registrar.

Add/Drop

All changes to individual class registration or enrollments are the **responsibility of the student**. The add/drop period continues through initial registration cycles until the end of the 8th day of instruction of each term. During this period, the student has the opportunity to add or drop classes. See specific dates for completing these transactions at https://registrar.calpoly.edu/Calendars_Deadlines/index.htm. Students are responsible for knowing and adhering to these published timelines and for their enrollments.

Adding

Closed classes: If a class is full, students may use a permission number, issued by the instructor, during the first 8 days of instruction. See https://registrar.calpoly.edu/Calendars_Deadlines/index.htm for details.

Time conflict: Students may not enroll in two classes that meet at the same time.

Eligibility: Students must meet prerequisite and Schedule of Classes footnote requirements and be in attendance at the first class meeting to remain enrolled in the class.

Late registration: Students registering late have until the end of the add/drop period to pay late registration fees and to register for classes through their Student Center with a permission number issued by the instructor of the class.

Dropping

Students have until the end of the 8th day of instruction to drop a class through their Student Center. No entry is made on their academic records. At the end of the regular add/drop period the instructor must assume that any student who has not dropped voluntarily remains officially enrolled in the class. For information on withdrawing after the end of the regular add/drop period see Withdrawals from Courses.

First class meeting: An instructor **may** drop a student from a class if the student is not present at the end of the first class meeting.

Footnote requirement: An instructor **may** drop a student from a class if the footnote requirements, as stated in PASS (online Schedule of Classes), are not met.

Prerequisite missing: An instructor **may** drop a student from a class if the prerequisite requirements, as stated in the catalog course description, have not been completed.

Canceled classes: If a class is canceled, students are automatically dropped and have no reporting responsibilities.

Leaves of Absence

Students are permitted to take a Planned Educational Leave or a Medical Leave with a written request and approval by campus officials.

Eligibility for All Leaves

1. A student on Educational or Medical Leave is considered to be in continuous attendance with the purpose of returning to the same curriculum that was in effect when the leave began.
2. A student on Educational or Medical Leave is not required to apply for readmission or pay an application fee provided that the student returns to the same major and within the time period agreed upon when the application was approved.
3. No more than two leaves are available to each student (totaling a maximum of 8 terms).
4. A student on leave may return and enroll for any term prior to the term when the leave is scheduled to end. NO leave is extended beyond the two-year limitation for any reason.
5. Any student on leave who fails to return and enroll within the time limits specified by the leave agreement is required to reapply for admission, pay the reapplication fee, and may be held to any new curriculum requirements which may be in effect.

Educational Leaves:

1. A Planned Educational Leave must be for a purpose that contributes to the student's educational objective and is approved by the student's major department head or chair.
2. To be considered for an Educational Leave, the student must be eligible to enroll for the term in which the leave begins and not be on academic probation.
3. The application for Educational Leave must be initiated and approved before the leave begins and is not granted retroactively.
4. Application forms and information concerning Leaves of Absence may be obtained from the Office of the Registrar.

Medical Leaves:

1. A Medical Leave provides time for the student to receive treatment or to recover from a disabling injury or other medical condition and is approved by a medical doctor.
2. The Medical Leave begins the term following the student's last term in attendance and may be granted retroactively based on the student's personal situation.
3. A written letter together with medical documentation is required. Information concerning Leaves of Absence may be obtained from the Office of the Registrar.

Returning Students

Matriculated students who have not enrolled in classes at Cal Poly for three consecutive quarters (excluding summer term) or have not been on an approved leave of absence will be discontinued and will be required to file an application for readmission. The application fee must accompany the application for readmission. See the Admission section for application deadlines for returning students.

IF YOU HAVE NOT ATTENDED ANY OF THESE CONSECUTIVE QUARTERS:	THEN THE NEXT QUARTER YOU HAVE TO ATTEND TO AVOID DISCONTINUATION IS:
Winter, Spring, Summer	Fall
Spring, Summer, Fall	Winter
Fall, Winter	Spring

Intrasystem and Intersystem Enrollment Programs

Fully matriculated students enrolled at any CSU campus have access to courses at other CSU campuses on a space available basis unless those campuses/programs are impacted. This access is offered without students being required to be admitted formally to the host campus and sometimes without paying additional fees. Students should consult their home campus academic advisors to determine how such courses may apply to their specific degree programs before enrolling at the host campus.

There are two programs for enrollment within the CSU and one for enrollment between CSU and the University of California or California community colleges. Additional information about these programs is available from the Office of the Registrar, Admin. 222.

CSU Concurrent Enrollment – matriculated students in good standing may enroll on a space available basis at both their home CSU campus and a host CSU campus during the same term. Credit earned at the host campus is reported to the home campus to be included on the student's

transcript at the home campus. This counts as residential credit towards the degree but is shown as transfer credit.

CSU Fully Online Courses – matriculated students in good standing may request enrollment in one course per term, offered by a CSU host campus on a quarter system. Enrollment requests will be granted based on available space, as well as completion of any stated prerequisites. Credit earned at the host campus is electronically reported to the student's home campus to be included on the student's transcript at the home campus.

CSU Visitor Enrollment – matriculated students in good standing enrolled at one CSU campus may enroll at another CSU campus for one term. Credit earned at the host campus is reported at the student's request to the home campus to be included on the student's transcript at the home campus as transfer credit.

Intersystem Cross Enrollment – matriculated CSU, UC, or community college students may enroll on a space available basis for one course per term at another CSU, UC, or community college and request that a transcript of record be sent to the home campus and recorded as transfer credit.

Health Screening

Students graduating from a California public high school do not need to submit immunization records. It is recommended that all students complete the medical questionnaires located on the Health and Counseling Portal. That portal can be accessed by logging into their Cal Poly Portal and selecting the "Health and Counseling Portal" icon.

All **other** entering CSU students are required to present proof of the following immunizations to the CSU campus they are attending before the beginning of their first term of enrollment. If proof cannot be presented at that time, then the following conditions must be met:

- **Measles and Rubella:** Students must submit proof of immunity to measles and rubella within one year of the time of first enrollment. The MMR immunization series consists of two shots, separated by at least 28 days. ***Students will not be allowed to register for a second year until they have fulfilled this requirement.***
- **Hepatitis B:** Students who are 18 years of age or younger at the start of their first term at a CSU campus must provide proof of full immunity against Hepatitis B prior to their second quarter. Full immunization against Hepatitis B consists of three timed doses of vaccine over a minimum 4 to 6 month period. ***Students will not be allowed to register for a second quarter until they have presented proof to Health Services that they have received at least one shot, and must complete the series prior to the second year of enrollment.***

Meningococcal Disease. All incoming freshmen who will be residing in on-campus housing will be required to complete the Meningococcal Disease Response Form indicating that they have received information about meningococcal disease and the availability of the vaccine to prevent contracting the disease and indicating whether they have chosen to receive the vaccination. This form is part of the University Housing application and will be sent to incoming freshmen by early fall.

Compliance with the requirements can be met in the following ways:

1. Submit Documentation

A copy of any one of the following will satisfy immunization requirements:

- School Immunization Record
- County Health Department Immunization Record (well-baby booklet)
- International Health & Immunization Record (used by military & foreign travelers)
- Family physician's record
- Verified record of blood test showing immunity

-or-

Download the Hepatitis B and Measles/Rubella Immunization Form
(<http://content-calpoly-edu.s3.amazonaws.com/hcs/1/documents/faq.pdf>) **and mail to:**

Health Services
California Polytechnic State University
1 Grand Avenue
San Luis Obispo, CA 93407-0210
or send via FAX: (805) 756-5298

2. Be immunized

For those who do not have documentation, immunizations can be obtained at:

- A private health care provider
- A local clinic or County Public Health Department
- The Cal Poly Health Center once an individual is an enrolled student

3. Have a blood test

A rubella/rubeola titer and/or Hepatitis B surface antibody test will determine if an individual is immune either by past immunization or by having had the diseases.

4. Request a waiver or exemption

- Medical: If medical circumstances contraindicate immunization, an individual may be granted an exemption.
- Religious: State law permits exemption from immunization for those who object to immunization on religious or personal grounds.
- Distance Learning: Students enrolled in a "Distance Learning" program only.
- Waivers for exemption are available at the Cal Poly Student Health Center.

In the event of an outbreak of these diseases, students who signed a waiver may be temporarily excluded from class, residence halls or campus.

For more information, visit http://hcs.calpoly.edu/content/health/req_immunizations or call Health Services at 805.756.1211.

COLLEGES AND PROGRAMS

College of Agriculture, Food and Environmental Sciences

Agricultural Sciences Bldg. (11), Room 211

Phone: 805.756.2161

<https://cafes.calpoly.edu>

Dean: Andy Thulin

Executive Associate Dean: Richard A. Cavaletto

Associate Dean: Nanine Van Draanen

Associate Dean: James P. Prince

Assistant Dean: Russ Kabaker

Academic Programs

Program name	Program type
Agribusiness	Minor
Agricultural and Environmental Plant Sciences	BS
Agricultural Business	BS
Agricultural Communication	BS, Minor
Agricultural Education	MAGEd, Minor
Agricultural Leadership	Minor
Agricultural Science	BS
Agricultural Systems Management	BS
Agriculture	MS, Credential
Animal Science	BS
BioResource and Agricultural Engineering	BS
Crop Science	Minor
Dairy Products Technology	MPS
Dairy Science	BS, Minor
Environmental Earth and Soil Sciences	BS
Environmental Soil Science	Minor
Environmental Management and Protection	BS
Equine Science	Minor
Event Planning and Experience Management	Minor
Food Science	BS, Minor
Forestry and Natural Resources	BS
Forestry Sciences	MS
Fruit Science	Minor
Geographic Information Systems for Agriculture	Minor
Indigenous Studies in Natural Resources and the Environment	Minor
Land Rehabilitation and Restoration Ecology	Minor
Landscape Horticulture	Minor
Meat Science and Processing	Minor
Military Science	Minor
Nutrition	BS, Minor, MS
Plant Protection	Minor
Poultry Management	Minor
Rangeland Resources	Minor
Recreation, Parks and Tourism Administration	BS

Sustainable Agriculture	Minor
Water Engineering Specialization	MS
Water Science	Minor
Wine and Viticulture	BS

The College of Agriculture, Food and Environmental Sciences (CAFES) offers programs reflecting the growing diversity of choices available and skills required in modern agriculture, life sciences, and related professions.

Mission Statement

The College of Agriculture, Food and Environmental Sciences uses a learn by doing approach to prepare leaders in agriculture, food systems, natural resources, and life sciences who are equipped to address the diverse needs of society.

Learning Outcomes

All students who complete a program in CAFES should be able to:

- Demonstrate expertise in and the use of technology in their respective discipline.
- Demonstrate effective oral and written communication skills.
- Make choices based on an understanding of personal and professional ethics and respect for diversity of people and ideas.
- Recognize leadership principles and skills.
- Evaluate and solve problems using critical thinking.
- Demonstrate an appreciation for sustainability and global perspectives.

Students take courses in their major field beginning with their first quarter of enrollment. This early exposure to their major provides them with specific knowledge to supplement that gained in other coursework in basic sciences, mathematics and the liberal arts. Moreover, it allows students to evaluate whether or not the curriculum selected is appropriate to their interests and abilities. Taking courses in the major throughout the academic program fosters personal contact with faculty and other students having common interests but varied backgrounds.

The students' early involvement in their major field, combined with the faculty's close contacts with schools, private industry, governmental agencies, and nonprofit organizations provide excellent opportunities for student internships during their junior or senior years. Other opportunities which enhance education, provide financial assistance, and help prepare students for the job market include enterprise projects, scholarships, and work-study jobs.

CAFES faculty are experts in their disciplines, and are dedicated to teaching. They are eager to help students learn, are readily available for consultation and are proud of their close relationship with students.

Academic advising is provided to all students through Academic Advising Centers and their major department in the college. Each student is assigned a faculty advisor. Students are encouraged to meet with their advisors quarterly to plan their schedule, review curriculum information, discuss career opportunities, and receive information on internships, enterprise projects and cooperative learning. Academic advising centers and resources provide guidance on university and college policies and procedures including course transfers, substitutions and other general information.

Student clubs are active in every department. The College's 43 clubs, many of which are affiliated with national professional organizations, provide an excellent forum for student and faculty interactions. Active club members may practice leadership skills, and attend national, state and local professional meetings, as well as participate in a variety of professional and social events.

Agricultural Lands and Outdoor Laboratories

Nearly 6,000 acres of on-campus agricultural production, processing and research land and facilities are available for student use at Cal Poly. These facilities provide students with unique opportunities for hands-on experiences which augment classroom instruction.

The campus farm includes a dairy, beef center, horse, sheep, swine and poultry units, horse training and show arenas, an animal nutrition center, meat processing center, veterinary clinic and rodeo facilities. Also available are irrigated and dryland fields for annual crops, orchards and vineyards, an irrigation demonstration field, erosion research facility, large-scale composting operation, hoop houses, arboretum, wholesale and retail nurseries, putting greens and turf research plots, a wine lab, and greenhouses. Eleven acres of certified organic farmland support our organic farming program.

Other Labs and Special Facilities

Special facilities include several microcomputer laboratories, laboratories with modern equipment for soil-plant-water testing, engineering testing and manufacturing shops, complete food processing units for dairy products, meats, fruit and vegetables, and four biotechnology and embryology laboratories.

Santa Cruz County Properties

The 3,200 acre Swanton Pacific Ranch and 600 acre Valencia Creek forest in Santa Cruz County were generously donated by Al Smith, alumnus of Cal Poly's former Crop Science Department. These properties provide students with an opportunity to live and work on a commercial farm with forestry, watershed management, cattle and organic crop production activities. The lands also support a wide range of research topics for undergraduate and graduate students.

Experiential Learning

Students have many opportunities to participate in experiential learning activities which exemplify Cal Poly's "learn by doing" philosophy. For example, more than 80 percent of CAFES classes include laboratories or activity sessions. Enterprise projects offer students practical experience in animal, plant, and food production, processing, and research. Some of these are financially backed by the Cal Poly Corporation and offer students entrepreneurial experiences similar to those found in private industry.

Courses

The courses offered in each undergraduate curriculum may be grouped into four areas:

Major

The major courses include a required cluster of courses in which the student expects to graduate. These courses constitute the core of specific preparation for the student's major field.

Support

The support courses draw from courses in agriculture, life sciences, and closely allied fields which support and supplement the block of courses constituting the student's major.

General Education

Courses are selected from the physical and life sciences, mathematics, communications, arts and humanities, and social, political, and economic institutions. These courses furnish the student with background and support for their academic program as well as providing cultural background for the students' intelligent participation in a complex world society.

Free Electives

Course selection from electives is designed to provide freedom for students to pursue interests of their choosing in any university department.

Recommended Preparation

In addition to pursuing the CSU mandated entrance requirements, high school and community college students are encouraged to participate in co-curricular activities as part of their preparation for admission to majors in Cal Poly's College of Agriculture, Food and Environmental Sciences. These activities could include, but are not limited to, FFA, 4-H, leadership roles in school clubs, meaningful work experience and community organizations.

Laboratory Safety

Students are required to meet sanitation and safety regulations in laboratories. These regulations are explained by the instructor at the first meeting of the class.

Graduate Programs

Agricultural Sciences Bldg., Room 211

Phone: 805.756.2161

<https://cafes.calpoly.edu/contact-graduate-programs>

Associate Dean: James P. Prince

jpprince@calpoly.edu

General Characteristics

Graduate studies in the College of Agriculture, Food and Environmental Sciences (CAFES) allow the student to pursue either a professional program designed to enhance the competencies of agricultural educators, or an academic program of graduate-level scholarly activities and research in one of several specializations. Graduates are prepared for:

- professional-level positions with business and industry, government, and foreign service in agriculture and related fields;
- continued graduate work at other institutions.

Admission/Acceptance Requirements – MS Only

- File an application for Graduate Admission via <https://www2.calstate.edu/apply> by the deadlines specified at <https://admissions.calpoly.edu/applicants/graduate/process.html>
- Submit Graduate Record Exam (GRE) General Test scores electronically to Institution Code: R4038
- Three Letters of Recommendation

Prerequisites

For consideration as a graduate student, an applicant will have completed a bachelor's degree from an accredited college/university with a minimum grade point average of 2.75 in the last 90-quarter units. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

All applicants who do not speak and write English as their primary language are required to complete the Test of English as a Foreign Language (TOEFL), taken within the last 2 years with a minimum score of 550 (paper version), 213 (computerized version), or 80 (internet based). Submit scores electronically to Institution Code: 4038. This requirement does not apply if your country of citizenship is listed on Cal Poly Admissions website: <https://admissions.calpoly.edu/applicants/international/checklist.html>

Each program may list additional requirements for admission to the specific program.

Degree Requirements

Formal Study Plan. Graduate students must file the formal study plan for the degree with the CAFES Graduate Coordinator no later than the end of the quarter in which the 12th unit of approved courses is completed. The formal program of study must include at least 45 units of committee-approved graduate coursework; at least half of the units required by the committee as reflected on the formal study plan must be at the 500 level. Students should refer to the course descriptions in this catalog for credit limitations of individual courses; for example, total credit for AG 500, Individual Study, is limited to six units.

All candidates must meet the current Graduation Writing Requirement (p. 32). All Students are required to pass an oral comprehensive examination which is normally given during the final quarter of the program of study. A written comprehensive exam may also be required by the master's degree committee, but this is optional. For students in a thesis program the final oral comprehensive examination includes, but is not necessarily limited to, a defense of the thesis.

Thesis

The thesis is based on independent, supervised research. Students should contact individual departments to determine the availability of funding support for their research. The final copy of the thesis must meet the standards explained in the "Manual of Instructions for the Preparation and Submission of the Master's Thesis or Master's Project" available from the Cal Poly Research and Graduate Programs Office. At least one course in statistical methods and/or experimental design is required of students in a thesis based curriculum.

A copy of the thesis or project report must be received and reviewed by the Thesis Editor in the Graduate Programs Office. Upon completion of any required corrections, the student submits the electronic thesis/project report to the DigitalCommons@CalPoly, a digital archive for the University. These steps must be completed before the degree is awarded.

Graduate Student Continuous Enrollment Policy

Effective Fall Quarter 2009, graduate students are required to maintain continuous enrollment from the time of first enrollment in a graduate program until completion of the degree. Continuous enrollment is defined as being enrolled during Fall, Winter, and Spring quarters each year. All graduate students must be enrolled the quarter they graduate. Therefore, a student graduating Summer quarter must be enrolled during the

summer. Students can maintain continuous enrollment either by being enrolled as a regular student; obtaining approval for an education or medical leave prior to the quarter when such a leave would begin; or by registering in a special course designated for this purpose, during quarters in which they are not regularly enrolled. The special course GS 597 is taken through Cal Poly Extended Education. Credits in GS 597 do not count toward meeting degree requirements. Students who fail to fulfill this continuous enrollment requirement will not be permitted to graduate even if all degree requirements have been completed until payment has been made for all quarters of non-enrollment. This requirement is not retroactive to terms prior to Fall 2009. For further information and a registration form, visiting the Extended Education (<http://www.extended.calpoly.edu>) website.

MS Agriculture, Specialization in Animal Science

The program provides students with an interdisciplinary, science-based program, where students develop basic scientific knowledge, apply that knowledge to a research project, then write and defend a thesis. An individual's coursework and research project is focused based upon his or her interests and goals in Animal Science, and under the guidance of the advisor and thesis committee.

Additional prerequisites: Prospective students are required to:

- submit a cover letter identifying interests, goals and experience relevant to the MS program, and
- submit a résumé

MS Agriculture, Specialization in BioResource and Agricultural Systems

Students have the opportunity to focus their MS program on the application of bioresource and agricultural systems. Graduates will be prepared to enter a career in a variety of areas including production agriculture, consulting, regulatory compliance, equipment sales and technical support, etc.

Topics under the **bioresource** area may include:

- Agricultural and Food Processing Waste Management
- Renewable Energy

Topics under the **agricultural systems** area may include:

- California Production Agriculture and Food Systems
- Precision Agriculture
- Automation and Mechanization in Agriculture

The multidisciplinary nature of these programs will allow students to select electives in departments throughout the university with adviser approval.

MS Agriculture, Specialization in Crop Science

For students with undergraduate preparation in plant agriculture and/or plant science. Current research is focused primarily in applied fruit crop physiology, vegetable breeding and physiology, sustainable fruit and vegetable production, viticulture, plant pathology, integrated pest

management, and postharvest technology, including sustainable packaging and packaging safety. Thesis required.

MS Agriculture, Specialization in Dairy Products Technology

An applied program for students who desire to use their academic preparation in food science and nutrition, dairy science, microbiology, chemistry, engineering, biochemistry and related fields to address applied research questions of impact to the field of dairy science and technology. The program requires the demonstration of strong analytical thinking, effective oral and written communication, and project management. Coursework and thesis experience are designed with flexibility to enhance and increase proficiency in scientific methods while enriching students' overall preparation to enter the workforce. Graduates enter research and development positions with major food companies, leadership positions in dairy food processing and other allied areas, or further graduate study for the Ph.D. Students have opportunity to work on funded research projects of the Dairy Products Technology Center and interact with multidisciplinary teams of scientists from throughout the world. International students are encouraged to apply.

Additional prerequisites: Prospective students are required to:

- submit a cover letter identifying interests, goals and experience relevant to the MS program, and
- submit a résumé

MS Agriculture, Specialization in Environmental Horticulture Science

For students with undergraduate preparation in horticulture and/or plant science. Current research is focused primarily in applied plant physiology, nursery and potted plant production, sustainable landscape development and maintenance, and integrated pest management. Thesis required.

MS Agriculture, Specialization in Food Science

The program provides a variety of courses and research opportunities in the field of Food Science (FS). Research and problem-solving opportunities are available in food chemistry, food microbiology, food safety, sensory analysis, food processing, and food engineering. A thesis is required. Research areas vary with faculty expertise and interest; refer to Food Science and Nutrition Department and College of Agriculture, Food and Environmental Sciences web pages for more information on faculty research. Graduates are prepared for further study in doctoral programs or for responsible positions in food industries.

MS Agriculture, Specialization in Irrigation

The program requires the demonstration of strong analytical thinking, effective oral and written communication, and project management. Additional prerequisites:

- B.S. or B.A. with proficiency in basic chemistry and math.

- Students must have successfully completed at least one undergraduate class in general irrigation, soil science, crop science, calculus, and hydraulics, plus be familiar with spreadsheets.

Students may complete prerequisite courses at Cal Poly if necessary.

MS Agriculture, Specialization in Plant Protection Science

For students with undergraduate preparation in plant agriculture, plant science, biological sciences, and/or ecology. Current research is focused on pest biology, tritrophic interactions, invasive species, integrated pest management, biological control and plant disease management. Projects provide the opportunity to conduct field and/or laboratory experiments with corporate stakeholders for career enhancement. Curriculum and research allows students to develop more diverse or specialized skill sets for post-graduate employment and/or opportunity to obtain required coursework for state licensing. Thesis required.

MS Agriculture, Specialization in Soil Science

Provides graduate level knowledge and skills for soils interpretation and management, for teaching, or for continuation into a PhD program. Department facilities include modern instrumentation, laboratories, and a glasshouse. Students have access to several thousand acres of agricultural, forest, and range lands. Graduates meet educational requirements for professional certification by the American Registry of Certified Professionals in Agronomy, Crops, and Soils, and as Certified Professional Erosion and Sediment Control Specialists.

MS Engineering, Specialization in Water Engineering

The College of Engineering and the BioResource and Agricultural Engineering Department jointly offer the Water Engineering Specialization under the M.S. Engineering. Please see College of Engineering (p. 191) section of this catalog for more information.

Interdisciplinary Minors

Descriptions of minors listed below are interdisciplinary in nature involving more than one department and/or college. For additional details on minors not listed below click here (<http://catalog.calpoly.edu/programsaz/#minors>).

Agricultural Communication Minor

Brock Center for Agricultural Communication
Agriculture Bldg. 10, Room 235
Phone: 805.756.2892
Coordinator: Megan Silcott

Completion of this interdisciplinary minor enhances students' ability to be successful in dynamic professions associated with the agricultural industry, including print journalism, broadcast journalism and public relations.

The minor is a cooperative effort between the College of Agriculture, Food and Environmental Sciences (CAFES) and the College of Liberal Arts (CLA). Students are advised by faculty members assigned to the Brock Center for Agricultural Communication. Student participation in the Cal

Poly chapter of the national Agricultural Communicators of Tomorrow (ACT) is encouraged.

Agricultural Leadership Minor

New program, effective Fall 2018

Agricultural Education and Communication
Bldg. 10, Room 10-244
Phone: 805.756.2803

Coordinator: Robert Flores

This minor provides students with an opportunity to develop as leaders and individuals. The minor is designed for any student to become a more effective communicator, increase teamwork and leadership ability, and increase self-awareness. Courses provide opportunities for students to apply their leadership abilities in a "learn by doing" environment. Core classes provide an overview of leadership theory, followership, communication, teamwork, diversity, inclusion, and practical experiences.

Students will enhance their leadership abilities by participating in a practicum/experiential course that will challenge students to apply their leadership skills. Several degree programs at Cal Poly complement this minor by providing courses that will enhance any student's leadership capabilities.

Environmental Studies Minor

Please see the College of Science and Mathematics (p. 336) for more information on this interdisciplinary minor.

Geographic Information Systems for Agriculture Minor

BioResource and Agricultural Engineering
Bldg. 08, Room 101
Phone: 805.756.2378

Coordinators:

Tom Mastin

Samantha Gill

An interdisciplinary program sponsored by three departments in CAFES: BioResource and Agricultural Engineering, Natural Resources Management and Environmental Sciences, and Horticulture and Crop Science. New technologies of geographic information systems (GIS), global positioning systems (GPS), and orthophotography (uniform scale aerial photographs) are revolutionizing the management of resources. There are great employment opportunities for those who understand these technologies. Students interested in this minor may come from the following majors: forestry and natural resources, crop science, soil science, landscape architecture, agricultural systems management, bioresource and agricultural engineering, animal science or earth sciences. Students from any major are welcome to take this minor.

Indigenous Studies in Natural Resources and the Environment Minor

An interdisciplinary minor sponsored by the departments of Natural Resources Management and Environmental Sciences and Ethnic Studies.

For more information, see the Natural Resources Management and Environmental Sciences (p. 127) section.

Land Rehabilitation and Restoration Ecology Minor

Natural Resources Management & Environmental Resources Department
Bldg. 180, Room 515
Phone: 805.756.1691

Coordinator: Chip Appel

Students completing the minor gain skills in recognizing, assessing, and treating disturbed lands for numerous purposes, including erosion and sediment control, water quality improvement, habitat restoration, and aesthetic enhancement. They develop proficiency in plant identification and selection, soil properties and processes, and ecological principles, and also learn to set criteria and judge the feasibility, prudence, efficiency, and effectiveness of rehabilitation efforts.

Each student is required to complete a hands-on rehabilitation or restoration field project that provides practical experience in recognizing, assessing, and treating a landscape disturbance. Before beginning the treatment phase, the student must prepare a written plan that includes a problem assessment, treatment design, anticipated outcome, and budget. This plan must be approved by the faculty advisor and the minor coordinator before land treatment begins. Project may be carried out individually or in small groups. Contact the minor coordinator for more details.

Rangeland Resources Minor

Animal Science
Bldg. 10, Room 141
Phone: 805.756.2419

Coordinator: Marc R. Horney

This interdisciplinary minor prepares students for careers in the science and management of semi-arid grasslands, shrublands, and savannas. This is an entry point into a wide range of careers in extensive agriculture (range and pasture-based livestock production), and environmental conservation - including wildlife and natural resource management. Students will learn purposes for and methods of assessing the health and productivity of rangeland ecosystems, and how to manage the herbivorous animals that depend on them. Coursework in the minor will give students an understanding of the interactions of plants, animals, water, soil and landscape features in these ecosystems. This minor will help prepare students for careers with land and wildlife management agencies at the state and federal level, and conservation organizations, as scientists, resource specialists, and managers. It can also strengthen a graduate's opportunities in the private sector as agricultural or environmental consultants, ecologists, wildlife biologists, wildland managers, ranch managers, and other natural resource management specialists. Completion of this minor meets the basic educational requirements for California Certified Rangeland Manager (CRM) licensing program (<http://casrm.rangelands.org/HTML/certified.html>).

Sustainable Agriculture Minor

Horticulture and Crop Science
Bldg. 11, Room 238

Phone: 805.756.2870
Coordinator: Ashraf Tubeileh

Students approach modern agricultural problems from a holistic perspective, emphasizing agricultural planning integrated with ecological principles. Through experience in sustainable agricultural practices, students learn about a farm/ranch in the context of an agro-ecosystem: a system whose processes and relationships can be manipulated to allow production with fewer adverse environmental impacts and external inputs. Students develop knowledge and skills involving holistic management, crop production, and adaptive decision-making in a hands-on environment. The minor is available to all Cal Poly students.

Water Science Minor

BioResource and Agricultural Engineering
Bldg. 08, Room 101
Phone: 805.756.2378

Irrigation Emphasis Coordinator: Franklin Gaudi

Natural Resources Management and Environmental Sciences
Bldg. 180, Room 518
Phone: 805.756.2743

Water Policy/Watershed Management Emphasis Coordinator: Christopher G. Surfleet

The minor emphasizes one of three areas of study: irrigation, water policy, or watershed management. In California, 85% of the developed water is used for irrigation. Irrigation water use and management have tremendous impacts upon ground water quality, power usage, crop yields, surface water supplies and quality, drainage problems, and water availability for transfer to urban uses. For students interested in the environment and water, the Water Science minor provides marketable skills.

MS Agriculture, Specialization in Animal Science

Required Courses

AG 581	Graduate Seminar	1
AG 599	Thesis	6
ASCI 581	Graduate Seminar in Animal Science	3
STAT 511	Statistical Methods	4
STAT 513	Applied Experimental Design and Regression Models	4
Select from the following:		16
AG 500	Individual Study	
ASCI 403	Applied Biotechnology in Animal Science	
ASCI 405	Domestic Livestock Endocrinology	
ASCI 406	Applied Animal Embryology and Assisted Reproduction	
ASCI 415	HACCP for Meat and Poultry Operations	
ASCI 420	Animal Metabolism and Nutrition	
ASCI 438	Systemic Animal Physiology	

ASCI 440	Immunology and Diseases of Animals	
or ASCI 540	Advanced Immunology and Diseases of Animals	
ASCI 450	Computer Applications in Animal Science: Spreadsheet Analysis	
ASCI 500	Individual Study in Animal Science	
ASCI 503	Advanced Molecular Techniques in Animal Science	
ASCI 593	Regenerative Medicine Internship	
ASCI 594	Applications in Regenerative Medicine	
AGED 438	Instructional Processes in Agricultural Education	
BIO 501	Molecular & Cellular Biology	
BIO 524	Developmental Biology Seminar	
CHEM 528	Nutritional Biochemistry	
NR 532	Applications in Biometrics and Econometrics	
Approved Electives ¹		
Any 400 and 500 level courses approved by the student's graduate committee		11
Total units		45

¹ At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.

MS Agriculture, Specialization in BioResource and Agricultural Systems

Required Courses

AG 581	Graduate Seminar	1
BRAE 418	Agricultural Systems Management I	4
BRAE 419	Agricultural Systems Management II	4
BRAE 599	Thesis in BioResource and Agricultural Engineering	6
SS 501	Research Planning	4
STAT 511	Statistical Methods	4
Approved Elective Options ¹		22
Students may be required to take undergraduate level prerequisites for selected electives. The final elective approval is at the discretion of the students' graduate committee		
General		
STAT 513	Applied Experimental Design and Regression Models	
Agricultural and Food Processing Waste Management		
BRAE 435	Drainage	
BRAE 440	Agricultural Irrigation Systems	
BRAE 532	Water Wells and Pumps	
NR/CRP 404	Environmental Law	
NR/CRP 408	Water Resource Law and Policy	
NR 416	Environmental Impact Analysis and Management	

NR 420	Watershed Assessment and Protection
NR 465	Ecosystem Management
Renewable Energy	
BRAE 448	Bioconversion
EE 420	Sustainable Electric Energy Conversion
EE/PHYS 422	Polymer Electronics Laboratory
EE 520	Solar-Photovoltaic Systems Design
ENVE 542	Sustainable Environmental Engineering
California Production Agriculture and Food Systems	
AEPS 421	Postharvest Technology of Horticultural Crops
BRAE 432	Agricultural Buildings
IME 430	Quality Engineering
ITP 409	Packaging Machinery and Processes
Precision Agriculture	
AEPS 406	Advanced Weed Management
AEPS 410	Crop Physiology
AEPS 423	Advanced Vegetable Science
AEPS 445	Cropping Systems
BRAE 447	Advanced Surveying with GIS Applications
BRAE 481	Advanced Agricultural Mechanics
NR 418	Applied GIS
SS 431	Digital Soil Mapping
Automation and Mechanization	
BRAE 425	Computer Controls for Agriculture
IME 416	Automation of Industrial Systems
Any 400 and 500 level courses approved by the student's graduate committee ¹	
Total units	45

¹ At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.

MS Agriculture, Specialization in Crop Science

Required Courses

AEPS 445	Cropping Systems	4
AEPS 581	Graduate Seminar in Crop/Fruit Production	3
AEPS 596	Thesis in Crop Science	6
SS 501	Research Planning	4
STAT 511	Statistical Methods	4
STAT 513	Applied Experimental Design and Regression Models	4

Approved Electives

Any 400 and 500 level courses, approved by the student's graduate committee	20
---	----

At least 60% of all units required for the degree as reflected on the formal study plan must be at the 500-level.

Total units 45

MS Agriculture, Specialization in Dairy Products Technology

Required Courses

DSCI 401	Physical and Chemical Properties of Dairy Products	4
DSCI 444	Dairy Microbiology	4
DSCI 570	Selected Topics in Dairy Science	3
DSCI 571	Selected Advanced Laboratory in Dairy Science	3
DSCI 581	Graduate Seminar in Dairy Science	3
DSCI 599	Thesis in Dairy Science	6
STAT 523	Design and Analysis of Experiments I	4

Approved Electives ¹

Any 400 and 500 level courses, approved by the student's graduate committee	18
---	----

Total units 45

¹ At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.

MS Agriculture, Specialization in Environmental Horticultural Science

Required Courses

AEPS 500	Individual Study in Horticulture and Crop Science	4
AEPS 581	Graduate Seminar in Crop/Fruit Production	3
AEPS 597	Thesis in Environmental Horticulture Science	6
SS 501	Research Planning	4
STAT 511	Statistical Methods	4
STAT 513	Applied Experimental Design and Regression Models	4

Approved Electives

Any 400 and 500 level courses approved by the student's graduate committee	20
--	----

At least 60% of all units required for the degree as reflected on the formal study plan must be at the 500-level.

Total units 45

MS Agriculture, Specialization in Food Science

Required Courses

FSN 564	Chemistry of Food Systems	4
FSN 575	Advanced Food Safety	4
FSN 581	Graduate Seminar in Food Science and Nutrition	3

FSN 599	Thesis	6
SS 501	Research Planning	4
STAT 511	Statistical Methods	4
Approved Electives		
Select from the following:		20
FSN 508	Food Product Innovation	
FSN 574	Food Process Failure Analysis	
Any 400 and 500 level courses, approved by the student's graduate committee.		
At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.		
Total units		45

MS Agriculture, Specialization in Irrigation

Required Courses

BRAE 405	Chemigation	1
BRAE 414	Irrigation Engineering	4
BRAE 435	Drainage	4
BRAE 438	Drip/Micro Irrigation	4
BRAE 440	Agricultural Irrigation Systems	4
BRAE 500	Individual Study	3
BRAE 532	Water Wells and Pumps	4
BRAE 533	Irrigation Project Design	4
BRAE 599	Thesis in BioResource and Agricultural Engineering	6
400-500 level research methods or statistics course		3
Approved Electives ¹		
Any 400 and 500 level courses approved by the student's graduate committee		8
Total units		45

¹ At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.

MS Agriculture, Specialization in Plant Protection Science

Required Courses

AEPS 581	Graduate Seminar in Crop/Fruit Production	3
AEPS 599	Thesis in Plant Protection Science	6
SS 501	Research Planning	4
STAT 511	Statistical Methods	4
STAT 513	Applied Experimental Design and Regression Models	4
Select from the following:		8
AEPS 406	Advanced Weed Management	
AEPS/WVIT 414	Grape Pest Management	
AEPS 427	Disease and Pest Control Systems for Ornamental Plants	
AEPS 431	Insect Pest Management	

AEPS 441	Biological Control for Pest Management	
Approved Electives		
Any 400 and 500 level courses approved by the graduate committee		16
At least 60% of all units required for the degree as reflected on the formal study plan must be at the 500-level.		
Total units		45

MS Agriculture, Specialization in Soil Science

Required Courses¹

SS 422	Soil Ecology	4
SS 423	Environmental Soil and Water Chemistry	5
SS 431	Digital Soil Mapping	4
SS 432	Environmental Soil Physics	5
SS 501	Research Planning	4
SS 508	Environmental Assessment for Erosion Control	3
SS 522	Advanced Soil Fertility	3
SS 581	Graduate Seminar in Environmental Sciences	3
SS 582	GIS in Advanced Land Management	3
SS 599	Thesis	6
Approved Electives ²		
Any 400 and 500 level courses approved by the graduate committee		5
Total units		45

¹ Soil Science students with credit in SS 422, SS 423, SS 431, or SS 432 from the undergraduate degree may substitute other courses in the Required Courses list.

² At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.

Agricultural Communication Minor

Required Courses

AGC 301	New Media Communication Strategies in Agriculture	4
AGED 404	Agricultural Leadership	3
COMS 301	Business and Professional Communication	4
JOUR 203	News Reporting and Writing	4
JOUR 205	Agricultural Communications	4

Approved Electives

Select from one of the following lists, based upon major (at least 4 units must be at the 300-400 level):

Majors in the College of Agriculture, Food and Environmental Sciences (at least 2 courses must be selected from COMS, ENGL, or JOUR)

AGB 405	Agribusiness Marketing Research Methods	
AGC 207	Software Applications for Agricultural Publications	
AGC 339	Internship in Agricultural Communications	
AGC 407	Agricultural Publications	
AGC 426	Presentation Methods in Agricultural Communication	
COMS 213	Organizational Communication	
COMS 217	Small Group Communication	
COMS 312	Communication Research Methods	
COMS 322	Persuasion	
COMS 385	Media Criticism	
COMS 390	Environmental Communication	
COMS 413	Advanced Organizational Communication	
ENGL 148	Reasoning, Argumentation and Professional Writing	
ENGL 310	Corporate Communication	
ENGL 317	Technical Editing	
GRC 377	Web and Print Publishing	
JOUR 219	Multicultural Society and the Mass Media	
JOUR 285	Introduction to Multimedia Journalism	
JOUR 303	Web Audio and Video	
JOUR 304	Public Affairs Reporting	
JOUR 312	Public Relations	
JOUR 331	Contemporary Advertising	
JOUR 333	Broadcast News	
JOUR 342	Public Relations Writing and Editing	
JOUR 346	Broadcast Announcing and Production	
JOUR 352	Advanced Newspaper Reporting Practicum	
JOUR 390	Visual Communication for the Mass Media	
JOUR 407	Feature Writing	

JOUR 413	Public Relations Campaigns
RPTA 320	Strategic Event Planning
Majors in a college other than the College of Agriculture, Food and Environmental Sciences	
AEPS 150	Forage Crops
AEPS 203	Organic Enterprise
AEPS 230	Environmental Horticulture
AEPS 250	California Fruit Growing
AEPS 260	Introduction to Vegetable Science
AGB 202	Introduction to Sales
AEPS/AG 315	Organic Crop Production
AGB 314	Fair and Fair Facility Management
AGB 318	Global Agricultural Marketing and Trade
AGB 406	Agribusiness Marketing Planning
AGC 207	Software Applications for Agricultural Publications
AGC 339	Internship in Agricultural Communications
AGC 407	Agricultural Publications
AGC 426	Presentation Methods in Agricultural Communication
ASCI 112	Principles of Animal Science
ASCI 221	Introduction to Beef Production
ASCI 225	Introduction to Poultry Management
BRAE 340	Irrigation Water Management
BRAE 348	Energy for a Sustainable Society
DSCI 230	General Dairy Husbandry
DSCI 231	General Dairy Manufacturing
FSN 210	Nutrition
FSN 230	Elements of Food Processing
FSN 275	Elements of Food Safety
GRC 201	Digital Publishing Systems
GRC 377	Web and Print Publishing
NR 141	Introduction to Forest Ecosystem Management
NR 142	Environmental Management
NR 306	Natural Resource Ecology and Habitat Management
NR/ES 308	Fire and Society
NR 321	Water Systems Technology, Issues and Impacts
NR 323	Human Dimensions in Natural Resources Management
NR/CRP 408	Water Resource Law and Policy
SS 121	Introductory Soil Science
or SS 131	Soils in Environmental and Agricultural Systems

Total units 30

Agricultural Leadership Minor

Required Courses

AG 254	Introduction to Agricultural Leadership	2
--------	---	---

AG 454	Agricultural Leadership Capstone	2
AGED 404	Agricultural Leadership	3
COMS/PSY 212	Interpersonal Communication	4
or RPTA 257	Leadership and Diverse Groups	
MSL 103	Basic Leadership	1-2
or MSL 201	Foundations of Leadership I	
or MSL 202	Foundations of Leadership II	
or MSL 203	Foundations of Leadership III	
MSL/RPTA 275	Facilitation and Teambuilding	2

Experiential Courses

Select from the following: 2-3

AG 410	Advanced Agricultural Leadership Experience	
AG 412	Advanced Leadership Practice: Poly Royal Rodeo	
AG 413	Committee Management: Poly Royal Rodeo	
AGED 412	Advanced Agricultural Leadership Development Practicum	
ASCI 412	Advanced Livestock Event Planning	
ASCI 490	Advanced Animal Production and Management Enterprise	
MSL 401	Developmental Leadership I	
NR/RPTA 472	Leadership Practice	

Approved Electives

Select from the following: 8

COMS 301	Business and Professional Communication	
COMS 420	Nonverbal Communication	
ENGL 302	Writing: Advanced Composition	
ENGL 310	Corporate Communication	
ENGL 317	Technical Editing	
PHIL 323	Ethics, Science and Technology	
PSY 301	Psychology of Personal Development	
PSY 302	Behavior in Organizations	
PSY 305	Personality	
PSY 350	Teamwork	
PSY 351	Group Dynamics	
PSY 352	Conflict Resolution: Violent and Nonviolent	
RPTA 325	Leadership in Outdoor Experiences	

Total units 24-25

Geographic Information Systems for Agriculture Minor

Required Courses

BRAE 133	Introduction to Engineering Design Graphics	1
BRAE 151	CAD for Agricultural Engineering	1
BRAE 239	Engineering Surveying	4
BRAE 345	Aerial Photogrammetry and Remote Sensing	3-4

or GEOG 328	Applications in Remote Sensing	
NR/LA 218	Introduction to Geographic Information Systems (GIS)	3-4
or GEOG 318	Applications in GIS	
NR 418	Applied GIS	3-4
or GEOG 440	Advanced-Applications in GIS	

Emphasis areas

Select one of the following emphasis areas: 12

Environmental Information Emphasis		
BRAE 447	Advanced Surveying with GIS Applications	
NR 306	Natural Resource Ecology and Habitat Management	
NR 416	Environmental Impact Analysis and Management	
or CRP 336	Introduction to Environmental Planning	

Precision Agriculture Emphasis

AEPS/BRAE 244	Precision Farming	
Select two of the following:		
AEPS 406	Advanced Weed Management	
AEPS 410	Crop Physiology	
AEPS 423	Advanced Vegetable Science	
AEPS 431	Insect Pest Management	
AEPS 445	Cropping Systems	
BRAE 447	Advanced Surveying with GIS Applications	

Total units 27-30

Land Rehabilitation and Restoration Ecology Minor

Before being admitted to the minor, students must have successfully completed the following courses: BOT 121 or BIO 114, SS 121, MATH 118 or MATH 161.

At least one-half of the units must be at the 300-400 level. Generally, courses required for the student's major degree cannot be counted toward the minor, except that courses selected in the required core may count in both the major and minor programs. This and other course exceptions must be approved by the minor coordinator. As a guideline, students should take at least 20 units from outside their major degree program.

Required Courses

Plant area:		
AEPS 381	Native Plants for California Landscapes	4
or BOT 313	Taxonomy of Vascular Plants	
Soils area:		
SS 321	Soil Morphology	4
SS 421	Wetlands	4
or SS 431	Digital Soil Mapping	
or SS 440	Forest and Range Soils	
Ecological Principles:		
AG 360	Holistic Management	4

or BIO 327	Wildlife Ecology	
or BOT 326	Plant Ecology	
NR 306	Natural Resource Ecology and Habitat Management	4
Project:		
Select from the following:		3
Special Problems		
Selected Advanced Topics		
Senior Project		
other course approved by the minor coordinator		
Approved Electives		
Select from the following:		3-5
AEPS 124	Plant Propagation	
AEPS 321	Weed Biology and Management	
AEPS 327	Vertebrate Pest Management	
ASCI 329	Principles of Range Management	
BOT 433	Field Botany: California Plant Diversity	
BRAE 340	Irrigation Water Management	
ERSC 223	Rocks and Minerals	
ERSC 303	Soil Erosion and Water Conservation	
NR/LA 218	Introduction to Geographic Information Systems (GIS)	
or GEOG 318	Applications in GIS	
NR 307	Fire Ecology	
NR 320	Watershed Processes and Management	
NR/CRP 408	Water Resource Law and Policy	
SS 221	Soil Health and Plant Nutrition	
SS 322	Soil Plant Relationships	
Total units		26-28

Rangeland Resources Minor

Required Courses

Range Resource Area		
ASCI 329	Principles of Range Management	4
ASCI 370	Rangeland Improvements	3
Rangeland Animal Management Area		
Select from the following: ¹		4
ASCI 223	Systems of Small Ruminant Management	
ASCI 311	Advanced Beef Cattle System Management	
ASCI 339	Internship in Animal Science	
BIO 427	Wildlife Management	
Rangeland Plant Physiology Area		
BIO 435	Plant Physiology	4
Rangeland Ecology Area		
Select from the following: ¹		4
AEPS 321	Weed Biology and Management	
BOT 326	Plant Ecology	
NR 306	Natural Resource Ecology and Habitat Management	

Rangeland Measurements Area		
Select from the following: ¹		4
AEPS 313	Agricultural Entomology	
BIO 419	Analytical Methods in Ecology	
SS 321	Soil Morphology	
SS 440	Forest and Range Soils	
Rangeland Policy/Planning Area		
Select from the following: ¹		3
AG/ASCI 360	Holistic Management	
ASCI 460	Rangeland Assessment and Planning	
CRP 342	Environmental Planning Methods	
NR/CRP 404	Environmental Law	
NR/CRP 408	Water Resource Law and Policy	
Total units		26

¹ At least one-half of the units must be 300-400 level. Select courses with advisor approval.

Sustainable Agriculture Minor

Required Courses

AEPS 203	Organic Enterprise	2
AEPS/AG 315	Organic Crop Production	4
AG 339	Internship in Agriculture	4
AG 360	Holistic Management	4
NR 324	Social Dimensions of Sustainable Food and Fiber Systems	4

Area Studies ¹

Select minimum of one course from three of the following Areas:		11
---	--	----

Agriculture and Society Area

AG 350	The Global Environment	
AGB 312	Agricultural Policy	
GEOG 301	Geography of Resource Utilization	
GEOG/ERSC 333	Human Impact on the Earth	
NR 142	Environmental Management	
SOC 309	The World System and Its Problems	
UNIV/POLS 333	World Food Systems	
UNIV/PSC/HNRS 391	Appropriate Technology for the World's People: Development	

Production Agriculture Area

AEPS 321	Weed Biology and Management	
AEPS 323	Plant Pathology	
AEPS 431	Insect Pest Management	
AEPS 441	Biological Control for Pest Management	
AEPS 445	Cropping Systems	
AGB 212	Agricultural Economics	
ASCI 221	Introduction to Beef Production	
ASCI 223	Systems of Small Ruminant Management	
ASCI 311	Advanced Beef Cattle System Management	
BRAE 340	Irrigation Water Management	

BUS 212	Financial Accounting for Nonbusiness Majors
SS 221 or SS 322	Soil Health and Plant Nutrition Soil Plant Relationships
Agroecology Area	
NR 306	Natural Resource Ecology and Habitat Management
NR 323	Human Dimensions in Natural Resources Management
SS 321	Soil Morphology
SS 440	Forest and Range Soils
Environmental Design Area	
AEPS 381	Native Plants for California Landscapes
EDES 406	Sustainable Environments
LA 202	Design Fundamentals I
LA 221	California Plants and Plant Communities
UNIV/PSC/HNRS 392	Appropriate Technology for the World's People: Design
Total units	

29

¹ Minimum 4 units at 300-400 level.

Water Science Minor

Required Courses

BRAE 340	Irrigation Water Management	4
NR 408	Water Resource Law and Policy	3
SS 121	Introductory Soil Science	4

Emphasis Area

Select one emphasis area:	13-18
---------------------------	-------

Irrigation Emphasis

Select 13 units from the following:	
BRAE 237 or BRAE 239	Introduction to Engineering Surveying Engineering Surveying
BRAE 312	Hydraulics
BRAE 331	Irrigation Theory
BRAE 405	Chemigation
BRAE 337	Landscape Irrigation
BRAE 414	Irrigation Engineering
BRAE 435	Drainage
BRAE 438	Drip/Micro Irrigation
BRAE 440	Agricultural Irrigation Systems
BRAE 532	Water Wells and Pumps
BRAE 533	Irrigation Project Design

Water Policy Emphasis

Select 17-18 units from the following:	
AGB 312	Agricultural Policy
BIO/NR/SS 421	Wetlands
CRP/NR 404	Environmental Law
NR 320	Watershed Processes and Management
NR 435	Environmental Policy Analysis

POLS 333	World Food Systems
POLS 351	Public Policy and Administration
Watershed Management Emphasis	
Select 16 units from the following:	
BIO/NR/SS 421	Wetlands
ERSC 303	Soil Erosion and Water Conservation
NR 306	Natural Resource Ecology and Habitat Management
NR 320	Watershed Processes and Management
NR 420	Watershed Assessment and Protection
SS 440	Forest and Range Soils
SS 442	Vadose Zone and Groundwater Processes
Total units	

24-29

Agribusiness

Agriculture Bldg. (10), Room 210
Phone: 805.756.5000; Fax: 805.756.5040
<https://agb.calpoly.edu>

Department Chair: Cyrus Ramezani

Academic Programs

Program name	Program type
Agricultural Business	BS
Agribusiness	Minor

A Bachelor of Science in Agricultural Business prepares students for exciting and satisfying careers in the dynamic global food and fiber supply chain. The program provides a course of study that develops the requisite critical thinking, problems solving and business skills that are required to have a successful career in firms and organizations that span and support industries and organizations across the entire food and fiber supply chain.

Career opportunities for Cal Poly Agribusiness graduates range from food and fiber production, logistics and transportation, marketing and finance to agricultural support organizations and government agencies, providing a wide range of choices for any graduate.

Undergraduate Programs

BS Agricultural Business

The Agricultural Business curriculum has been developed to allow for a flexible course of study. Students can choose to emphasize their upper-division coursework a specific industry area such as Food Retail Management, Finance and Appraisal, Supply Chain Management, and Sales and Marketing or generalize their studies, all while being provided with an industry recognized, business-ready set of skills. Students are encouraged to get involved with academic clubs and teams, which provide additional opportunities for the Learn-by-Doing leadership experience. In addition, the Agribusiness Department internship program is one of the largest at Cal Poly and is well-respected by industry, with many students transitioning internships into careers post graduation.

Agribusiness Minor

In today's ever more complex, technology-driven world, it is necessary for any graduate in agriculture to have some exposure to marketing, personnel management, financial management, budgeting, and economics if they are to succeed. The minor is designed to give students in the College of Agriculture, Food and Environmental Sciences this opportunity. Interested students must apply for acceptance into the minor through the Agribusiness Department.

BS Agricultural Business

Program Learning Objectives

1. Exhibit critical thinking and complex problem-solving skills leading to lifelong learning.
2. Possess strong interpersonal and teamwork skills, as well as the ability to work independently.

3. Develop technical competency in their discipline but will also learn to think in a broader global context.
4. Act with professionalism, high ethical standards, and respect for diversity and sustainability.
5. Possess oral and written communication skills that are effective with diverse audiences (employers, employees, industry, and government).
6. Industry-ready with skills and knowledge that employers value.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: Up to 4 units of credit/no credit grading may be selected for courses in major or support.

MAJOR COURSES

AGB 101	Introduction to Agribusiness	4
AGB 202	Introduction to Sales	4
AGB 212	Agricultural Economics	4
AGB 214	Agribusiness Financial Accounting	4
AGB 260	Agribusiness Data Literacy	4
AGB 301	Food and Fiber Marketing	4
AGB 308	Introduction to Agribusiness Finance	4
AGB 312	Agricultural Policy	4
AGB 313	Agriculture Economic Analysis	4
AGB 323	Agribusiness Managerial Accounting	4
AGB 327	Agribusiness Data Analysis	4
AGB 328	Decision Tools for Agribusiness	4
AGB 369	Agricultural Personnel Management	4
AGB 460 & AGB 461	Research Methodology in Agribusiness and Senior Project	4
or AGB 462	Senior Project - Applied Agribusiness Problems	
or AGB 463	Senior Project - Agribusiness Consulting	

Agribusiness general electives ²

Select one 4-unit AGB course at the 400 level	4
Select AGB courses at the 300, 400, or 500 levels	12

SUPPORT COURSES

BUS 207	Legal Responsibilities of Business	4
CHEM 110	World of Chemistry (B3 & B4) ¹	4
ECON 222	Macroeconomics (D2) ¹	4
MATH 221	Calculus for Business and Economics (B1) ^{1,3}	4
STAT 251	Statistical Inference for Management I (B1) ¹	4

Agricultural science and technology electives

Select from the following:	12
AEPS 120	Principles of Horticulture and Crop Science

AEPS 132	Pomology I	
AEPS 150	Forage Crops	
AEPS 230	Environmental Horticulture	
AEPS 250	California Fruit Growing	
AEPS 260 or AEPS 190	Introduction to Vegetable Science California Vegetable Production	
AEPS 421	Postharvest Technology of Horticultural Crops	
ASCI 112	Principles of Animal Science	
ASCI 211	Meat Science	
ASCI 225	Introduction to Poultry Management	
ASCI 229	Anatomy and Physiology of Farm Animals	
ASCI 321	Zoonoses and Veterinary Public Health Concerns	
BRAE 340	Irrigation Water Management	
BRAE 438	Drip/Micro Irrigation	
DSCI 230	General Dairy Husbandry	
DSCI 231	General Dairy Manufacturing	
FSN 210	Nutrition	
FSN 230	Elements of Food Processing	
FSN 250	Food and Nutrition: Customs and Culture	
FSN 275	Elements of Food Safety	
FSN 341	Fermented Foods	
SS 121	Introductory Soil Science	
SS 131	Soils in Environmental and Agricultural Systems	
SS 221	Soil Health and Plant Nutrition	
SS 321	Soil Morphology	
SS 440	Forest and Range Soils	
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		56
FREE ELECTIVES		
Free Electives		20
Total units		180

¹ Required in Support; also satisfies GE.

² 500-level courses used for a baccalaureate degree may not be applied toward a master's degree or credential program. Consultation with advisor is recommended.

³ Prerequisite: Passing score on appropriate Mathematics Placement Examination, or MATH 118 or equivalent.

General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4

Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course (In Support) ¹	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy (4 units in Support) ¹	0
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		56

¹ Required in Support; also satisfies GE.

Agribusiness Minor

Note: One course in the minor may be graded credit/no credit.

Required Courses

AGB 212	Agricultural Economics	4
AGB 214	Agribusiness Financial Accounting	4
or BUS 212	Financial Accounting for Nonbusiness Majors	
AGB 301	Food and Fiber Marketing	4
AGB 308	Introduction to Agribusiness Finance	4
or AGB 310	Agribusiness Credit and Finance	
AGB 369	Agricultural Personnel Management	4

Approved Electives ¹

Select from the following:	8
Any AGB course except AGB 101 (at least 2 units must be at the 300-400 level)	
Total units	28

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Agricultural Education & Communication

Agriculture Bldg. (10), Room 244
Phone: 805.756.2803
<https://aged.calpoly.edu>

Academic Programs

Program name	Program type
Agricultural Communication	BS
Agricultural Education	Master of, Minor
Agricultural Science	BS

The Cal Poly Agricultural Education and Communication Department's contribution to the agriculture industry is unparalleled in preparing passionate leaders to advance agricultural education and communication.

Graduates are prepared to effectively organize, communicate, and lead others. Whether teaching the students of California about the application of science, management, fiber and natural resource systems — or sharing the compelling story of agriculture — our graduates help shape the public opinion of the multibillion dollar agricultural industry.

Students studying agricultural science are exposed to a wide variety of coursework in the various disciplines in the College of Agriculture, Food, and Environmental Sciences. The degree provides the flexibility to explore careers leading to teaching, animal and plant production, the agricultural service industry, and various management and leadership positions in agriculture. Graduates leave Cal Poly with the technical and professional skills needed to lead in a variety of occupations and with a comprehensive understanding of how the various agricultural sectors contribute to overall industry success.

In addition to the department's long history of leadership and service to the state's agricultural education profession, it also boasts California's only agricultural communication major, widely considered one of the country's premier undergraduate programs. Through a partnership with the university's Brock Center for Agricultural Communication, plus unique Learn by Doing opportunities, students gain the necessary knowledge to be effective communicators who are fully equipped to promote agriculture and serve the needs of the industry.

Undergraduate Programs

BS Agricultural Communication

The BS Agricultural Communication program prepares students to become professional communicators in the agriculture industry and related fields. Graduates of the program are effective oral and written communicators with an applied knowledge of emerging new media. All students within the major take a common series of courses. The Brock Center for Agricultural Communication provides students the opportunity for industry linkages and professional preparation in this rapidly growing career area.

BS Agricultural Science

The BS Agricultural Science program offers a choice of one of six emphasis areas, plus approved electives that may be selected from one of two **career pathways**:

- 1) preparation of future agriculture teachers for the public secondary schools of California, or
- 2) professional preparation for broad-based agricultural occupations.

The six **emphasis areas** are:

- Agricultural Engineering Technology
- Agricultural Supplies and Services
- Animal Science
- Crop and Soil Science
- Forestry and Natural Resources
- Ornamental Horticulture

It is critical that students intent on pursuing a teaching credential meet with a faculty advisor to ensure that planned courses meet credentialing requirements.

Teaching Credential

Students can declare their candidacy for teaching while pursuing the undergraduate degree. Early field experiences are a part of the Agricultural Science major and required for entrance into the credential program. Students interested in pursuing a career in agricultural education but not enrolled in the Agricultural Science major should consider seeking a minor in Agricultural Education.

Teacher candidates are required to enroll in post-baccalaureate work to obtain the the Single Subject in Agriculture and Agricultural Specialist credentials. Candidates must complete a minimum of 45 units of post-baccalaureate coursework. The Single Subject Content Advisor in Agricultural Education can provide more information. It is to the advantage of the post-baccalaureate teaching candidates to be simultaneously enrolled in the Master of Agricultural Education degree program.

Agricultural Education Minor

The Agricultural Education minor helps students obtain the knowledge, skills, and attitudes needed for completion of subject matter competency for earning the Single Subject-Agriculture and the Agriculture Specialist teaching credentials. Students must obtain prior program approval from the Single Subject Content Advisor for Agriculture Education in selecting approved electives courses based on the student's prior agricultural background and the completion of major-specific courses. Interested students should see the department head for Agricultural Education and Communication . The minor is not open to students majoring in Agricultural Science.

Additional Minors

Agricultural Communication Minor

In association with the Brock Center for Agricultural Communication, selected interdisciplinary courses in Journalism, Graphic Communications, English, Communication Studies and Agriculture make up the Agricultural Communication minor. Career preparation includes a

breadth and depth in agriculture along with a foundation in journalism, and an industry internship. For more information about the minor, see College of Agriculture, Food and Environmental Sciences (p. 63).

Graduate Program

Master of Agricultural Education

General Characteristics

The Master of Agricultural Education program provides students with the opportunity to focus their graduate study in agricultural education, with an emphasis on preparing candidates for positions as teachers of agricultural education in public schools. The degree is a non-thesis, terminal program that provides practitioners with opportunities for professional development. At least one year of successful high school or community college teaching is required for completion of this degree program. Working with their advisor and graduate committee, students generally complete projects for coursework in the program that enhance their employment settings, or assist them to become compliant with statewide standards in agricultural education.

Prerequisites

For consideration as a graduate student, an applicant will have completed a bachelor's degree from an accredited college or university with a minimum grade point average of 2.75 in the last 90 quarter units. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

All applicants who do not speak and write English as their primary language are required to complete the Test of English as a Foreign Language (TOEFL), with a minimum score of 550, and the Test of Written English (TWE), with a minimum score of 4.5.

Program of Study

Graduate students must file a formal study plan for the degree with the Graduate Coordinator of the College of Agriculture, Food and Environmental Sciences no later than the end of the quarter in which the 12th unit of approved courses is completed. The formal program of study must include at least 45 units of committee-approved graduate coursework; at least 50 percent of the units required by the committee as reflected on the formal study plan must be at the 500 level. Students should refer to the course descriptions in the catalog for credit limitations of individual courses; for example, total credit for , Individual Study, is limited to six units. All candidates must meet the current Graduation Writing Requirement.

All students in the Master of Agricultural Education degree program are required to pass a written and oral comprehensive examination, scheduled normally during the final quarter of the program of study.

BS Agricultural Communication

Program Learning Objectives

1. Demonstrate and apply excellent written, verbal, listening and visual communication skills.
2. Demonstrate knowledge of current communications practices, including effective writing, layout and design, photography, computer skills, and oral communication.

3. Demonstrate the ability to work in a professional communications setting through experiential-learning (i.e. internships, work experience, student organizations).
4. Analyze and communicate effectively about major issues in agriculture.
5. Understand the importance of effective communication in the agriculture industry.
6. Use and evaluate technologies that enhance the communication process.
7. Apply ethical practices in daily work and recognize media and corporate roles and responsibilities in society.
8. Demonstrate awareness and sensitivity to cultural demographics of an increasingly global agriculture industry.
9. Develop a high degree of agricultural literacy and an adequate reservoir of skills and knowledge in agricultural subjects to meet the need of the agricultural communication profession and the industry.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 2.0 GPA
- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No major courses may be selected as credit/no credit.

MAJOR COURSES

AGC 102	Orientation to Agricultural Communication	2
or AGED 102	Introduction to Agricultural Education	
AGC 207	Software Applications for Agricultural Publications	2
AGC 301	New Media Communication Strategies in Agriculture	4
AGC 339	Internship in Agricultural Communications	4
or AG 339	Internship in Agriculture	
or AGED 339	Internship in Agricultural Education	
AGC 407	Agricultural Publications	4
AGC 426	Presentation Methods in Agricultural Communication	4
AGED 404	Agricultural Leadership	3
AGED 460	Research Methodology in Agricultural Education and Communication	1
AGC 461	Senior Project I	1
or AGED 461	Senior Project I	
AGC 462	Senior Project II	1
or AGED 462	Senior Project II	
BIO 111	General Biology (B2 & B4) ¹	4
or BIO 161	Introduction to Cell and Molecular Biology	
CHEM 110	World of Chemistry (B3 & B4) ¹	4
COMS 301	Business and Professional Communication	4
COMS 316	Intercultural Communication (USCP)	4

ECON 222	Macroeconomics (D2) ¹	4
ENGL 310	Corporate Communication	4
GRC 377	Web and Print Publishing	4
or JOUR 390	Visual Communication for the Mass Media	
JOUR 203	News Reporting and Writing	4
JOUR 205	Agricultural Communications	4
JOUR 312	Public Relations	4
MATH 118	Precalculus Algebra (B1) ^{1, 2}	4
STAT 217	Introduction to Statistical Concepts and Methods (B1) ¹	4
or STAT 218	Applied Statistics for the Life Sciences	
Agricultural Business and Economics		
AGB 212	Agricultural Economics	4
AGB 301	Food and Fiber Marketing	4
AGB 312	Agricultural Policy	4
Agricultural Systems Technology		
BRAE 121	Agricultural Mechanics	2-3
or BRAE 141	Agricultural Machinery Safety	
Animal Science		
ASCI 112	Principles of Animal Science	4
Select from the following:		4
ASCI 221	Introduction to Beef Production	
ASCI 222	Systems of Swine Production	
ASCI 223	Systems of Small Ruminant Management	
ASCI 224	Equine Science	
ASCI 225	Introduction to Poultry Management	
DSCI 230	General Dairy Husbandry	
Environment and Natural Resources		
AG/ASCI 360	Holistic Management (F) ¹	4
BRAE 340	Irrigation Water Management	4
NR/ES 308	Fire and Society (D5) ¹	4
or NR 323	Human Dimensions in Natural Resources Management	
SS 121	Introductory Soil Science	4
or SS 131	Soils in Environmental and Agricultural Systems	
Food Science		
FSN 230	Elements of Food Processing	4
FSN 275	Elements of Food Safety	4
Plant Science		
AEPS 120	Principles of Horticulture and Crop Science	4
Agricultural Issues		
Select from the following:		4
AEPS/BOT 329	Plants, Food, and Biotechnology	
AG 452	Issues Affecting California Agriculture	
AGC 452	Current Trends and Issues in Agricultural Communication	
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		44
FREE ELECTIVES		

Free Electives	7-8
Total units	180

¹ Required in Major; also satisfies GE.

² MATH 116 and MATH 117 substitute.

General Education (GE) Requirements

- 72 units required, 28 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Major) ¹	0
B2	Life Science (4 units in Major) ¹	0
B3	Physical Science (4 units in Major) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy (4 units in Major) ¹	0
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective (4 units in Major) ¹	0
Area F	Technology	
F	Upper-division elective (4 units in Major) ¹	0
Total units		44

¹ Required in Major; also satisfies GE

BS Agricultural Science

Program Learning Objectives

1. Possess the well-rounded subject matter breadth and depth required to effectively teach subject matter in agriculture.
2. Professionally communicate and articulate knowledge to others in multi modal, succinct and creative teaching styles.
3. Lead and direct individuals and groups in thought and action.
4. Analyze and communicate effectively about major issues in agriculture.

5. Demonstrate cultural competencies in an increasingly global agricultural industry and society.
6. Develop a high degree of agricultural literacy.
7. Demonstrate critical thinking and problem solving skills.
8. Seamlessly and professionally integrate technology into instructional practices.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, student must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

AGED 102 or AGC 102	Introduction to Agricultural Education Orientation to Agricultural Communication	2
AGED 404	Agricultural Leadership	3
AGED 410	Computer Applications in Agricultural Education	2
AGED 460	Research Methodology in Agricultural Education and Communication	1
AGED 461 or AGC 461	Senior Project I Senior Project I	1
AGED 462 or AGC 462	Senior Project II Senior Project II	1
AGC 452 or AG 360 or AG 450 or AG 452	Current Trends and Issues in Agricultural Communication Holistic Management Applied Holistic Management Issues Affecting California Agriculture	4
AEPS 120 or AEPS 230	Principles of Horticulture and Crop Science Environmental Horticulture	4
AGB 202	Introduction to Sales	4
AGB 212	Agricultural Economics	4
AGB 301	Food and Fiber Marketing	4
Select one from the following:		4
AEPS 150	Forage Crops	
AEPS 190	California Vegetable Production	
AEPS 250	California Fruit Growing	
AEPS 260	Introduction to Vegetable Science	
ASCI 112	Principles of Animal Science (B2) ¹	4
ASCI 225	Introduction to Poultry Management	4
BRAE 121	Agricultural Mechanics	2
BRAE 141	Agricultural Machinery Safety	3
DSCI 230	General Dairy Husbandry	4
DSCI 231 or FSN 230	General Dairy Manufacturing Elements of Food Processing	4
SS 121	Introductory Soil Science	4

or SS 131	Soils in Environmental and Agricultural Systems	
Approved Electives in Emphasis Area		
Select courses from the below Guide to Approved Electives - Emphasis Areas. At least 12-20 units must be at the 300-400 level.		24
SUPPORT COURSES		
BRAE 340	Irrigation Water Management (Area F) ¹	4
CHEM 110 or CHEM 111	World of Chemistry (B3 & B4) ¹ Survey of Chemistry	4-5
MATH 118 or MATH 119	Precalculus Algebra (B1) ^{1,2} Precalculus Trigonometry	4
NR/ES 308 or NR 323	Fire and Society (D5) ¹ Human Dimensions in Natural Resources Management	4
Approved Electives in Career Area		
Select courses from the below Guide to Approved Electives - Career Areas. At least 12-20 units must be at the 300-400 level. ³		28
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		52
FREE ELECTIVES		
Free Electives ³		0-1
Total units		180

Guide to Approved Electives - Emphasis Areas

Approved electives have been categorized by emphasis area to guide students in their selections. Advisor approval of electives is not required, but consultation with an advisor is recommended to ensure that the required number of upper-division units is met. Also, bear in mind that selection may impact pursuit of post-baccalaureate studies and/or goals. It is imperative for students seeking a teaching credential to select one Emphasis Area and adhere to the approved list of courses.

Emphasis Areas

Select Emphasis Area of choice (At least 12 to 20 units must be at the 300-400 level):	24
--	----

Agricultural Engineering Technology

Core Courses:		
BRAE 133	Introduction to Engineering Design Graphics	
BRAE 237 or BRAE 239	Introduction to Engineering Surveying Engineering Surveying	
BRAE 321	Agricultural Safety	
BRAE 335	Internal Combustion Engines	
Select from the following electives:		
BRAE 142	Agricultural Power and Machinery Management	
BRAE 151	CAD for Agricultural Engineering	
BRAE 152	3-D Solids Modeling	
BRAE 240	Agricultural Engineering Laboratory	
BRAE 331	Irrigation Theory	
BRAE 337	Landscape Irrigation	

BRAE 348	Energy for a Sustainable Society
BRAE 438	Drip/Micro Irrigation
BRAE 481	Advanced Agricultural Mechanics
BRAE 532	Water Wells and Pumps
PHYS 121	College Physics I

Agricultural Supplies and Services

Core Courses:

AGB 214	Agribusiness Financial Accounting ⁴
AGB 309	Advanced Sales Techniques
AGB 310	Agribusiness Credit and Finance

Select from the following electives:

AGB 260	Agribusiness Data Literacy
AGB 312	Agricultural Policy
AGB 313	Agriculture Economic Analysis
AGB 314	Fair and Fair Facility Management
AGB 322	Principles of Agribusiness Management
AGB 323	Agribusiness Managerial Accounting
AGB 331	Farm Accounting
AGB 369	Agricultural Personnel Management
AGB 404	Food Retail Management
AGB 440	Field Studies in Agribusiness
AGB 445	Produce Marketing
AGB 455	Advanced Fair Management Seminar
WVIT 343	Branded Wine Marketing

Animal Science

Core Courses:

ASCI 220	Introductory Animal Nutrition and Feeding
----------	---

Select two from the following:

ASCI 221	Introduction to Beef Production
ASCI 222	Systems of Swine Production
ASCI 223	Systems of Small Ruminant Management

Select one from the following:

DSCI 330	Artificial Insemination and Embryo Biotechnology
ASCI 321	Zoonoses and Veterinary Public Health Concerns
ASCI 350	Nonruminant Nutrition

Select from the following electives:

ASCI 311	Advanced Beef Cattle System Management
ASCI 325	Egg Production, Processing and Distribution
ASCI 329	Principles of Range Management
ASCI 330	Poultry Meat Production and Processing
ASCI 342	Poultry Business Management
ASCI 425	Meat Industry Study Tour
DSCI 301	Dairy Cattle Nutrition
DSCI 333	Dairy Animal Health, Safety and Applied Technology

Crop and Soil Science

Core Courses:

AEPS 150	Forage Crops
SS 221	Soil Health and Plant Nutrition

Select from the following electives (must be a course not already taken in the major):

AEPS 321	Weed Biology and Management
AEPS 355	Citrus and Avocado Fruit Production
AEPS 421	Postharvest Technology of Horticultural Crops
AEPS 423	Advanced Vegetable Science

Forestry and Natural Resources

Core Courses:

BIO 227	Wildlife Conservation Biology
NR 142	Environmental Management
NR 208	Dendrology
NR 306	Natural Resource Ecology and Habitat Management

Select from the following electives:

NR/ES 308	Fire and Society
NR 312	Technology of Wildland Fire Management
NR/LA 317	The World of Spatial Data and Geographic Information Technology
NR 321	Water Systems Technology, Issues and Impacts
NR 323	Human Dimensions in Natural Resources Management
NR/ES 360	Ethnicity and the Land
NR 402	Forest Health
NR/CRP 404	Environmental Law
NR/CRP 408	Water Resource Law and Policy

Ornamental Horticulture

Core Courses:

BOT 121	General Botany
AEPS 123	Landscape Installation and Maintenance
AEPS 124	Plant Propagation

Select from the following electives:

AEPS 301	Principles of Landscape Design
AEPS 341	Cut Flower Production
AEPS 342	Potted Plant Production
AEPS 343	Turfgrass Management
AEPS 381	Native Plants for California Landscapes
AEPS 424	Nursery Crop Production
AEPS 432	Specialized Operations for Golf Courses and Athletic Fields
AEPS 437	Park and Public Space Management
BRAE 337	Landscape Irrigation

Guide to Approved Electives - Career Areas

The following approved electives have been categorized by career area to guide students in their selections. Advisor approval of career

area electives is not required, but consultation with an advisor is recommended to ensure that the required number of upper-division units is met. Also, bear in mind that selection may impact pursuit of post-baccalaureate studies and/or goals.

It is imperative for students seeking a teaching credential to follow the Teaching Agriculture Career Area and adhere to the approved list of courses. No more than 8 units total of BIO, BOT, CHEM, GEOL, MCRO, MSCI, PHYS can count towards the Teaching Agriculture Electives. If you are following the Individualized Career Area and need to count more than 8 units of the course prefixes listed above, consult with your advisor for approval.

Career Areas

Select Career Area of choice (At least 12-20 units must be at the 300-400 level): 28

Individualized

Any course with a prefix of AEPS, AG, AGC, AGED, AGB, ASCI, BRAE, DSCI, ERSC, FSN, NR, RPTA, SS, WVIT, COMS, GRC, JOUR (that is not already counting towards GE area), or any courses included as a required course within a minor at Cal Poly.

Teaching Agriculture

AGB 214 Agribusiness Financial Accounting
or BUS 212 Financial Accounting for Nonbusiness Majors

AGED 303 FFA and Supervised Agricultural Experience

AGED 350 Early Field Experience in Agriculture Education

Teaching Agriculture Electives

Restriction: No more than 8 units total of BIO, BOT, CHEM, GEOL, MCRO, MSCI, PHYS courses can count towards Teaching Agriculture Electives.

Select 4 units from the following electives:

AGED 220 Agricultural Youth Conferences

BUS 207 Legal Responsibilities of Business

ECON 222 Macroeconomics

IME 142 Manufacturing Processes: Materials Joining

KINE 305 Drugs in Society
or KINE 443 Health Education for Teachers

Any lower division or upper division course with a prefix of AEPS, AG, AGB, ASCI, BIO, BOT, BRAE, CHEM, DSCI, ERSC, FSN, GEOL, MCRO, MSCI, NR, PHYS, RPTA, SS, WVIT.

Select 14 units from the following electives:

Any upper division courses with a prefix of AEPS, AG, AGB, ASCI, BIO, BOT, BRAE, CHEM, DSCI, ERSC, FSN, GEOL, MCRO, MSCI, NR, PHYS, RPTA, SS, WVIT.

¹ Required in Major or Support; also satisfies GE.

² MATH 116 and MATH 117 substitute.

³ The teaching credential requires specific courses. Consult with an advisor prior to developing an academic plan.

⁴ Students in the teaching career area pathway may not double-count this course.

General Education (GE) Requirements

- 72 units required, 20 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (4 units in Support plus 4 units in GE) ¹	4
B2	Life Science (4 units in Major) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E) ²	4
D5	Upper-division elective (4 units in Support) ¹	0
Area F	Technology	
F	Upper-division elective (4 units in Support) ¹	0
Total units		52

¹ Required in Major or Support; also satisfies GE.

² Teaching candidates are advised to take KINE 250.

Agricultural Education Minor

Required Courses

AGED 303	FFA and Supervised Agricultural Experience	4
AGED 350	Early Field Experience in Agriculture Education	2
AGED 410	Computer Applications in Agricultural Education	2
KINE 250 or KINE 443	Healthy Living ¹ Health Education for Teachers	4
Approved Electives ²		
Select from the following: ¹		12
AEPS 120	Principles of Horticulture and Crop Science	

or AEPS 150	Forage Crops
or AEPS 230	Environmental Horticulture
AEPS 190	California Vegetable Production
or AEPS 250	California Fruit Growing
or AEPS 260	Introduction to Vegetable Science
AG 360	Holistic Management
or AG 450	Applied Holistic Management
or AG 452	Issues Affecting California Agriculture
or NR 308	Fire and Society
AGB 214	Agribusiness Financial Accounting
AGB 301	Food and Fiber Marketing
ASCI 112	Principles of Animal Science
ASCI 225	Introduction to Poultry Management
BRAE 121	Agricultural Mechanics
BRAE 141	Agricultural Machinery Safety
BRAE 340	Irrigation Water Management
or BRAE 348	Energy for a Sustainable Society
BRAE 481	Advanced Agricultural Mechanics
DSCI 230	General Dairy Husbandry
DSCI 330	Artificial Insemination and Embryo Biotechnology
IME 142	Manufacturing Processes: Materials Joining
SS 121	Introductory Soil Science
Total units	24

Required Courses

AGED 520	Program Development in Agricultural Education	3
AGED 522	Laboratory Pedagogy in Agricultural Technology	3
or AGED 523	Laboratory Organization and Management in Agricultural Education	
AGED 539	Graduate Internship in Agricultural Education ¹	6
or AGED 524 & AGED 540	Instructional Processes in Agricultural Education and Instructional Planning in Agriculture	
Approved Electives		33
Any 400-500 level courses approved by the student's graduate committee.		
At least 11 units must be at the 500 level.		
Total units		45

¹ Students are required to complete or be enrolled in AGED 539 (or AGED 524 and AGED 540) to be eligible to complete the comprehensive written and oral examinations.

¹ If KINE 250 is taken, at least four units of 300-400 level coursework must be taken in Approved Electives in order to meet the Upper Division requirement for the minor.

² Consultation with advisor is recommended prior to selecting approved electives; keep in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Master of Agricultural Education

Program Learning Objectives

1. Apply knowledge of philosophical and historical foundations of agricultural education to develop personal philosophy statements which guide components of the agricultural education programs.

2. Create relevant, challenging and integrative agricultural curriculum.

3. Adapt curriculum to meet curricular goals and objectives using a variety of educational theories and models.

4. Demonstrate effective teaching characteristics while utilizing a wide variety of teaching and learning strategies.

5. Select appropriate practices to teach essential agricultural concepts, problem solving, skills of inquiry, communication and collaboration.

6. Develop, administer and analyze formal, informal and performance assessment techniques to monitor and evaluate student learning and guide modification.

7. Develop as reflective practitioners by collecting feedback, evaluating learning segments, and supporting artifacts.

Animal Science

Agriculture Bldg. (10), Room 141
Phone: 805.756.2419; Fax: 805.756.5069
<https://animalscience.calpoly.edu>

Department Head: Jaymie Noland

Academic Programs

Program name	Program type
Animal Science	BS
Dairy Products Technology	MPS
Dairy Industries	Minor
Dairy Science	BS
Equine Science	Minor
Meat Science and Processing	Minor
Poultry Management	Minor
Rangeland Resources	Minor

Animal Science offers programs in both Animal and Dairy Sciences. Students have the opportunity to apply the principles of animal biology, husbandry and behavior, with molecular biology and other life sciences to a variety of species. Students can apply these principles to farm animals, exotic animals, laboratory animals, and to their own pets. The curriculum is very flexible, which allows students to work with their faculty advisor to plan an individual curriculum in line with their interests and career goals. This is a comprehensive "hands-on, learn-by-doing" program, so students work with animals of several species on a regular basis. Students learn the science and practical applications to be effective problem-solvers and leaders as they move on to professional and graduate schools, animal production and management, animal and dairy food processing, or numerous other career opportunities.

Students may select coursework in one of the following areas: pre-veterinary medicine, food animal production, dairy science, equine science, poultry management, agribusiness, biotechnology, comparative animal biology studies, rangeland resource management, dairy products technology and meat science.

The department offers a wide assortment of co-curricular activities including five different student clubs, competitive livestock and horse judging teams and intercollegiate dressage and equestrian teams. Students participate in organizing and conducting service meetings, seminars and field days sponsored by the department.

In addition, students are involved with faculty in research and development of new technologies related to animal health, production, and processing, using state-of-the-art equipment, facilities and technologies. Through extensive undergraduate research opportunities, students are prepared for careers in discovery, science and innovation.

Experiential Learning

The Animal Science Department has extensive modern animal facilities for hands-on experience. The department is supported by state-of-the-art biotechnology labs, a new beef center, beef cattle evaluation center, new animal nutrition center for animal food manufacturing, and an extensive equine center with breeding barn, labs, new stalls and training arenas. Additionally, students are able to use nearly 6,000 acres of rangeland, a swine center, sheep center, a state-of-the-art poultry center, an on-campus veterinary clinic for student learning and a new meat processing center. The modern dairy facility includes the Dairy Cattle Instructional

Building, containing the milking parlor, meetings rooms and classrooms, a nutrition and physiology lab, a microbiology lab, and a computer lab dedicated to dairy management and application software. The campus creamery is well-equipped with modern processing equipment. Students are employed on a part-time basis to work in both the production and processing areas.

The department maintains beef cattle, a dairy herd, horses, sheep, swine, and poultry. The dairy herd includes 110 each of milking-age registered Jerseys and Holsteins, located on a well-planned unit where feeding, milking, calf raising, artificial insemination, and management are carried out. Both herds are recognized for their high production and outstanding type. Animal operations are supported by an on-campus veterinary clinic, dairy processing and meat processing facilities, and an animal nutrition center. By actively participating in the management of the herds and flocks, students simulate the larger commercial operations of the industry. The enterprise system is another valuable experience for students, and industry internships are strongly encouraged.

Swanton-Pacific Ranch

The department has an active role in the management of the Swanton-Pacific Ranch and is developing environmentally sound resource management practices including intensive controlled grazing, multiple species grazing, and using the grazing animal as a tool to enhance the total environment of the ranch. Cal Poly's Animal Science major provides the knowledge and understanding to apply new technologies for the fast-changing, technology-driven world in which we live. The department's focus is to help students build a plan for personal and professional growth. Students develop the ability to apply and manage technology, and they also learn how to be team players, with the ability to solve problems utilizing leadership and professional communication skills. Most importantly, students are taught how to learn so they can adapt to the future.

Leprino Foods Dairy Innovation Institute

The Leprino Foods Dairy Innovation Institute houses the Cal Poly Creamery, Dairy Products Technology Center (DPTC) and the Master of Professional Studies in Dairy Products Technology program. The DPTC focuses on multidisciplinary dairy foods research and training activities designed to support the dairy industry and consumers of dairy products. Current research areas are: cheese chemistry and technology, bioseparation processes, and new product and process development. The Center has state-of-the-art research and development as well as technology transfer facilities. Students may conduct dairy foods related research projects under the guidance of Dairy Science faculty. Opportunities also exist to work on joint projects with other institutions.

Undergraduate Programs

BS Animal Science

Students in the Animal Science Department study a variety of disciplines including pre-veterinary medicine, animal biotechnology, food animal production in beef and dairy cattle, goats, sheep, and swine, comparative animal biology, equine science, poultry management, range resources management, and meat science.

Through the use of Cal Poly's extensive rangelands, irrigated pastures, housing and handling structures, as well as laboratory and research facilities, students learn the different areas of study in an experiential environment. This learn-by-doing approach gives students opportunities to work closely with animals and their professors. The

animal science major incorporates an assortment of interests with a flexible curriculum that integrates well with students' career goals.

BS Dairy Science

The Bachelor of Science degree in Dairy Science is designed to prepare students for employment in the various phases of the dairy industry, as well as related fields. All students within the major take a common core of courses and select additional courses in an area of interest, which may include: dairy farm or plant management, processing technology, agriculture communication, management, preparation for graduate or veterinary school, and agriculture teaching.

Dairy Industries Minor

The purpose of this science-based minor is to help students from other disciplines gain a basic understanding of the terminology and practices used within the two segments of the dairy industry. Two specialization areas are available within the Dairy Industries minor: Dairy Husbandry and Dairy Foods. Students may choose to pursue either specialization. After completion of the minor, students should have a basic understanding of cattle, dairy nutrition, milk production and management or dairy food processing, food quality and regulatory control. Prospective students should understand that completion of a basic level of introductory biology, chemistry, and statistics is assumed for this minor. In addition, some upper division courses may also require microbiology, organic/biochemistry and/or anatomy and physiology.

Equine Science Minor

The Equine Science minor is designed for students interested in developing a knowledge of, and competency in, the areas of equine training, nutrition and reproduction. This science-based program exposes students to various aspects of the horse industry, including basic equine management, training, and breeding farm management. By completing this minor, students gain an understanding of the principles and practices used within the equine industry.

Meat Science and Processing Minor

The minor incorporates knowledge of general food science, basic meat science and the principles and practices of adding value to raw materials through livestock harvesting, carcass fabrication and the manufacture of further processed meat and poultry products. Opportunities for business and management training are available. The minor meets the requirements needed to become eligible for jobs with the government or commercial meat processing firms and other businesses associated with the production of food products containing meat or poultry. In addition to the required courses, selected courses address basic principles of microbiology, food science, food sanitation and safety, food chemistry and process control procedures, and other optional courses are offered in agribusiness.

Poultry Management Minor

The Poultry Management minor prepares students for a wide variety of positions in the commercial poultry industry and in many allied services related directly to the industry. Career opportunities are many and varied.

Students have an opportunity to conduct enterprise projects in the production of market eggs, hatching eggs, meat birds, replacement pullets, turkey, and game birds, which give them valuable experience in production techniques as well as exposure to a number of business activities related to production. Advanced students may have opportunities to study special topics related to problems in management of commercial poultry flocks.

The program is supported by a state-of-the-art poultry production facility. Cal Poly's Poultry Unit is now considered one of the best in the Western United States; it accommodates commercial laying hen operation, egg processing facility, hatching, meat processing facility and battery and floor pen research facilities. These production facilities allow students to gain hands-on learning which complements their formal class work, and provides real-world experience.

Rangeland Resources Minor

The department participates in offering an interdisciplinary minor in Rangeland Resources. Please see College of Agriculture, Food and Environmental Sciences (p. 63) section for more information.

Graduate Programs

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Animal Science. Please refer to the MS Agriculture (p. 64) section of the College of Agriculture, Food and Environmental Sciences.

MS Agriculture, Specialization in Dairy Products Technology

Cal Poly offers a Master of Science degree in Agriculture with a specialization in Dairy Products Technology. Please refer to the MS Agriculture (<http://catalog.calpoly.edu/collegesandprograms/collegeofagriculturefoodenvironmentalsciences/#graduate>) section of the College of Agriculture, Food and Environmental Sciences.

MPS Dairy Products Technology

The Master of Professional Studies in Dairy Products Technology is an innovative program designed to prepare students from technical disciplines for rewarding and lucrative careers in the large-scale industrial dairy foods manufacturing industry. The program recruits students with critical thinking and analytical skills they will have developed while obtaining degrees in physical sciences, certain life sciences, or other technical disciplines. Through the use of experience based learning and project-based learning students will develop the essential knowledge to succeed in the international dairy foods industry.

Program of Study

Graduate students in the MPS in Dairy Products Technology program will be required to take a prescribed program of study that will give them the understanding of the industry structure, unit operations, sanitation, quality control and regulatory requirements. In addition, graduates will have developed the leadership skills and experience that is necessary to control and guide teams in industrial dairy plant operations. Three quarters of on campus course work will be followed by a one-quarter internship related to industrial dairy foods manufacturing. To graduate with the MPS in Dairy Products Technology students must pass a one-day practical examination following the internship.

Admission Requirements

A Bachelor degree obtained in a field with substantial analytical and critical thinking. Preference is given for degrees in physical or life sciences. Prospective students are required to submit a cover letter identifying interests, goals, and experience relevant to the MPS program and a resume. Submit a Graduate Record Exam (GRE) General Test scores electronically to Institution Code: 4038.

Those who do not possess a bachelor degree from a postsecondary institution where English is the principal language of instruction must take either the Test of English as a foreign language (TOEFL) or the International English Language Testing System (IELTS) exam.

The TOEFL must have been taken within the last two years with a minimum score of 550 (paper version), 213 (computerized version) or 80 (internet based). The minimum score for the IELTS is 6.5.

BS Animal Science Program Learning Objectives

1. Demonstrate problem solving skills.
2. Demonstrate a proficiency in working as a leader and as a part of a team to achieve common goals.
3. Integrate and apply technical and conceptual knowledge.
4. Exhibit an understanding of their professional and ethical responsibilities as animal scientists.
5. Communicate effectively in a professional manner.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

ASCI 101	Introduction to the Animal Sciences	2
ASCI 112	Principles of Animal Science	4
ASCI 211	Meat Science	4
ASCI 220	Introductory Animal Nutrition and Feeding	4
ASCI 229	Anatomy and Physiology of Farm Animals	4
ASCI 290	Animal Production and Management Enterprise	4
or ASCI 490	Advanced Animal Production and Management Enterprise	
ASCI 304	Animal Genomics	3
ASCI 351	Reproductive Physiology	4
ASCI 363	Undergraduate Seminar	2
ASCI 477	Senior Project - Research Experience in Animal Science	3

or ASCI 478	Senior Project - Advanced Internship Experience in Animal Science
or ASCI 479	Senior Project - Current Topics in Animal Science

Production courses

Select one from each of the three categories: 12

Ruminants

ASCI 221	Introduction to Beef Production
or ASCI 223	Systems of Small Ruminant Management
or DSCI 230	General Dairy Husbandry

Nonruminants

ASCI 222	Systems of Swine Production
or ASCI 225	Introduction to Poultry Management

Companion Animals

ASCI 224	Equine Science
or ASCI 227	Companion Animal Science

Biochemistry/Chemistry

Select from the following: 4-5

ASCI 320	Physiological Chemistry of Animals
CHEM 313	Survey of Biochemistry and Biotechnology
CHEM 371	Biochemical Principles

Nutrition

Select from the following: 3-4

ASCI 346	Equine Nutrition
ASCI 350	Nonruminant Nutrition
ASCI 355	Ruminant Nutrition
ASCI 420	Animal Metabolism and Nutrition
DSCI 301	Dairy Cattle Nutrition

Physiology

Select from the following: 3-5

ASCI 333	Equine Reproduction
ASCI 347	Equine Exercise Physiology
ASCI 366	Veterinary Pharmacology
ASCI 405	Domestic Livestock Endocrinology
ASCI 406	Applied Animal Embryology and Assisted Reproduction
ASCI 438	Systemic Animal Physiology
ASCI 440	Immunology and Diseases of Animals
ASCI 455	Advanced Equine Reproductive Technologies
DSCI 321	Lactation Physiology
DSCI 330	Artificial Insemination and Embryo Biotechnology

Technology/Management

Select from the following: 8-9

AG/ASCI 360	Holistic Management
or AG 450	Applied Holistic Management
ASCI 310	Technical Veterinary Skills
ASCI 311	Advanced Beef Cattle System Management
ASCI 312	Production Medicine
ASCI 315	Equine Biomechanics

ASCI 325	Egg Production, Processing and Distribution
ASCI 329	Principles of Range Management
ASCI 330	Poultry Meat Production and Processing
ASCI 340	Animal Welfare and Ethics
ASCI 342	Poultry Business Management
ASCI 366	Veterinary Pharmacology
ASCI 370	Rangeland Improvements
ASCI 384	Processed Meat Products
ASCI 403	Applied Biotechnology in Animal Science
ASCI 406	Applied Animal Embryology and Assisted Reproduction
ASCI 407	Assisted Reproduction Technologies of Gametes and Embryos Laboratory
ASCI 410	Applied Animal Behavior Science
ASCI 415	HACCP for Meat and Poultry Operations
ASCI 440	Immunology and Diseases of Animals
ASCI 450	Computer Applications in Animal Science: Spreadsheet Analysis
ASCI 455	Advanced Equine Reproductive Technologies
ASCI 460	Rangeland Assessment and Planning

Approved electives

Select courses from the list of approved electives; see Approved Electives Guide below. At least 14 units required at the 300-400 level. 24

SUPPORT COURSES

BIO 111	General Biology (B2 & B4) ²	4
or BIO 161	Introduction to Cell and Molecular Biology	
BIO 302	Human Genetics	4-5
or BIO 303	Survey of Genetics	
or BIO 351	Principles of Genetics	
CHEM 127	General Chemistry for Agriculture and Life Science I (B3 & B4) ²	4
CHEM 128	General Chemistry for Agriculture and Life Science II	4
CHEM 216	Organic Chemistry I ³	5
or CHEM 312	Survey of Organic Chemistry	
MATH 118	Precalculus Algebra (B1) ^{2,4}	4
or MATH 161	Calculus for the Life Sciences I	
STAT 218	Applied Statistics for the Life Sciences (B1) ²	4

GENERAL EDUCATION (GE)

(see GE program requirements below.) 56

FREE ELECTIVES

Free Electives	1-7
Total units	180

Approved Electives Guide

Approved electives have been organized by area of interest to guide students in their selections. Any course on this list can be used as an elective; courses not on this list can serve as an elective but require faculty advisor approval. Consultation with a faculty advisor is recommended to ensure that the required number of upper-division units is met. Also, bear in mind that selection may impact pursuit of post-baccalaureate studies and/or goals.

Pre-Veterinary Medicine

ASCI 227	Companion Animal Science ⁶
ASCI 290	Animal Production and Management Enterprise
ASCI 310	Technical Veterinary Skills ⁶
ASCI 315	Equine Biomechanics ⁶
ASCI 320	Physiological Chemistry of Animals ⁶
ASCI 333	Equine Reproduction ⁶
ASCI 339	Internship in Animal Science ⁵
ASCI 340	Animal Welfare and Ethics
ASCI 347	Equine Exercise Physiology ⁶
ASCI 366	Veterinary Pharmacology ⁶
ASCI 405	Domestic Livestock Endocrinology ⁶
ASCI 420	Animal Metabolism and Nutrition ⁶
ASCI 438	Systemic Animal Physiology ⁶
ASCI 440	Immunology and Diseases of Animals ⁶
ASCI 490	Advanced Animal Production and Management Enterprise
BIO 160	Diversity and History of Life
BIO 161	Introduction to Cell and Molecular Biology ⁶
BIO 162	Introduction to Organismal Form and Function
BIO 303	Survey of Genetics ⁶
BIO 351	Principles of Genetics ⁶
BIO 361	Principles of Animal Physiology
BIO 401	Principles of Conservation Biology
CHEM 129	General Chemistry for Agriculture and Life Science III
CHEM 217	Organic Chemistry II
CHEM 218	Organic Chemistry III
CHEM 220	Organic Chemistry Laboratory For Life Sciences II
CHEM 223	Organic Chemistry Laboratory for Life Sciences III
CHEM 371	Biochemical Principles ⁶
CHEM 372	Metabolism
DSCI 330	Artificial Insemination and Embryo Biotechnology ⁶
MATH/HNRS 141	Calculus I (B1) ⁶
or MATH 161	Calculus for the Life Sciences I
MATH/HNRS 142	Calculus II (B1)
or MATH 162	Calculus for the Life Sciences II
MCRO 221	Microbiology

PHYS 121	College Physics I
PHYS 122	College Physics II
PHYS 123	College Physics III
PHYS 125	College Physics I Laboratory
PHYS 131	General Physics I
PHYS 132	General Physics II
PHYS 133	General Physics III
PHYS 141	General Physics IA
PHYS 200	Special Problems for Undergraduates
Biotechnology	
ASCI 290	Animal Production and Management Enterprise
ASCI 339	Internship in Animal Science ⁵
ASCI 366	Veterinary Pharmacology ⁶
ASCI 403	Applied Biotechnology in Animal Science ⁶
ASCI 405	Domestic Livestock Endocrinology ⁶
ASCI 406	Applied Animal Embryology and Assisted Reproduction ⁶
ASCI 407	Assisted Reproduction Technologies of Gametes and Embryos Laboratory
ASCI 440	Immunology and Diseases of Animals ⁶
ASCI 490	Advanced Animal Production and Management Enterprise
BIO 161	Introduction to Cell and Molecular Biology ⁶
BIO 162	Introduction to Organismal Form and Function
BIO/CHEM 202	Orientation to Biotechnology
BIO 231	Human Anatomy and Physiology I
BIO 232	Human Anatomy and Physiology II
BIO 308	Genetic Engineering Technology
BIO 351	Principles of Genetics ⁶
BIO 405	Developmental Biology
BIO 410	Functional Histology
BIO/CHEM 475	Molecular Biology Laboratory
BIO/CHEM 476	Gene Expression Laboratory
CHEM 129	General Chemistry for Agriculture and Life Science III
CHEM 216	Organic Chemistry I ⁶
CHEM 217	Organic Chemistry II
CHEM 220	Organic Chemistry Laboratory For Life Sciences II
CHEM 373	Molecular Biology
CHEM 377	Chemistry of Drugs and Poisons
CHEM 474	Protein Techniques Laboratory
CHEM 477	Biochemical Pharmacology
MCRO 221	Microbiology
MCRO 224	General Microbiology I
MCRO 225	General Microbiology II
MCRO 320	Emerging Infectious Diseases
MCRO 421	Food Microbiology
PSY 340	Biopsychology

Food Animal Production

AEPS 150	Forage Crops
AG/ASCI 360	Holistic Management (GE Area F) ⁶
AGB 322	Principles of Agribusiness Management
ASCI 212	Livestock Show Management
ASCI 221	Introduction to Beef Production ⁶
ASCI 222	Systems of Swine Production ⁶
ASCI 223	Systems of Small Ruminant Management ⁶
ASCI 225	Introduction to Poultry Management ⁶
ASCI 226	Livestock Evaluation
ASCI 260	Preparation of Livestock for Shows and Sales
ASCI 270	Selected Topics
ASCI 290	Animal Production and Management Enterprise
ASCI 311	Advanced Beef Cattle System Management ⁶
ASCI 312	Production Medicine ⁶
ASCI 329	Principles of Range Management ⁶
ASCI 339	Internship in Animal Science ⁵
ASCI 340	Animal Welfare and Ethics
ASCI 412	Advanced Livestock Event Planning
ASCI 413	Advanced Livestock Event Management
ASCI 450	Computer Applications in Animal Science: Spreadsheet Analysis ⁶
ASCI 470	Selected Advanced Topics
BIO 427	Wildlife Management
BRAE 141	Agricultural Machinery Safety
DSCI 230	General Dairy Husbandry
DSCI 241	Dairy Cattle Selection, Breeds, Fitting and Showing
DSCI 301	Dairy Cattle Nutrition
DSCI 330	Artificial Insemination and Embryo Biotechnology
NR 142	Environmental Management
NR/LA 218	Introduction to Geographic Information Systems (GIS)
SPAN 101	Elementary Spanish I
SS 121	Introductory Soil Science

Comparative Animal Biology Studies

ASCI 203	Animal Parasitology
ASCI 290	Animal Production and Management Enterprise
ASCI 321	Zoonoses and Veterinary Public Health Concerns
ASCI 339	Internship in Animal Science ⁵
ASCI 490	Advanced Animal Production and Management Enterprise
BIO 162	Introduction to Organismal Form and Function

BIO 227	Wildlife Conservation Biology
BIO 263	Introductory Ecology and Evolution
BIO 327	Wildlife Ecology
BIO 442	Behavioral Ecology
BIO 444	Population Ecology
MSCI 324	Marine Mammals, Birds and Reptiles
MSCI 330	Technologies for Ocean Discovery
PSY 458	Learning
STAT 313	Applied Experimental Design and Regression Models

Equine Science

AG 243	Theory and Practice of Rodeo
ASCI 214	Equine Management
ASCI 224	Equine Science ⁶
ASCI 228	Equine Evaluation
ASCI 265	Equine Behavior and Training
ASCI 290	Animal Production and Management Enterprise
ASCI 315	Equine Biomechanics ⁶
ASCI 324	Advanced Equine Evaluation
ASCI 329	Principles of Range Management ⁶
ASCI 333	Equine Reproduction ⁶
ASCI 339	Internship in Animal Science ⁵
ASCI 344	Equine and Human Communication
ASCI 345	Equine Behavior Modification
ASCI 346	Equine Nutrition ⁶
ASCI 347	Equine Exercise Physiology ⁶
ASCI 455	Advanced Equine Reproductive Technologies ⁶
ASCI 490	Advanced Animal Production and Management Enterprise

Poultry Management

AGB 310	Agribusiness Credit and Finance
ASCI 225	Introduction to Poultry Management ⁶
ASCI 290	Animal Production and Management Enterprise ⁵
ASCI 325	Egg Production, Processing and Distribution ⁶
ASCI 330	Poultry Meat Production and Processing ⁶
ASCI 339	Internship in Animal Science ⁵
ASCI 342	Poultry Business Management
ASCI 350	Nonruminant Nutrition ⁶
ASCI 415	HACCP for Meat and Poultry Operations ⁶
ASCI 440	Immunology and Diseases of Animals ⁶
ASCI 490	Advanced Animal Production and Management Enterprise
BUS 207	Legal Responsibilities of Business
BUS 212	Financial Accounting for Nonbusiness Majors
BUS 346	Principles of Marketing

ENGL 310	Corporate Communication
FSN 275	Elements of Food Safety
FSN 334	Food Packaging
FSN 335	Food Quality Assurance
FSN 370	Food Plant Sanitation and Prerequisite Programs

Rangeland Resource Management

AG/ASCI 360	Holistic Management (GE Area F) ⁶
ASCI 290	Animal Production and Management Enterprise ⁵
ASCI 311	Advanced Beef Cattle System Management ⁶
ASCI 329	Principles of Range Management ⁶
ASCI 370	Rangeland Improvements
ASCI 460	Rangeland Assessment and Planning
ASCI 490	Advanced Animal Production and Management Enterprise
BIO 263	Introductory Ecology and Evolution
BIO 435	Plant Physiology
BOT 121	General Botany
BOT 313	Taxonomy of Vascular Plants
NR/LA 218	Introduction to Geographic Information Systems (GIS)
NR 306	Natural Resource Ecology and Habitat Management
NR 320	Watershed Processes and Management
NR 335	Conflict Management in Natural Resources
NR/CRP 404	Environmental Law
NR 418	Applied GIS
SS 121	Introductory Soil Science
SS 131	Soils in Environmental and Agricultural Systems
SS 321	Soil Morphology

Meat Science

ASCI 290	Animal Production and Management Enterprise ⁵
ASCI 339	Internship in Animal Science ⁵
ASCI 384	Processed Meat Products ⁶
ASCI 415	HACCP for Meat and Poultry Operations ⁶
ASCI 425	Meat Industry Study Tour
ASCI 490	Advanced Animal Production and Management Enterprise
DSCI 401	Physical and Chemical Properties of Dairy Products
FSN 125	Introduction to Food Science
FSN 275	Elements of Food Safety
FSN 370	Food Plant Sanitation and Prerequisite Programs
MCRO 221	Microbiology
MCRO 421	Food Microbiology

Agribusiness

AGB 202	Introduction to Sales
AGB 212	Agricultural Economics
AGB 214 or BUS 212	Agribusiness Financial Accounting Financial Accounting for Nonbusiness Majors
AGB 301	Food and Fiber Marketing
AGB 310	Agribusiness Credit and Finance
AGB 312	Agricultural Policy
AGB 313	Agriculture Economic Analysis
AGB 314	Fair and Fair Facility Management
AGB 322	Principles of Agribusiness Management
AGB 369	Agricultural Personnel Management
ASCI 212	Livestock Show Management
ASCI 260	Preparation of Livestock for Shows and Sales
ASCI 290	Animal Production and Management Enterprise
ASCI 311	Advanced Beef Cattle System Management ⁶
ASCI 329	Principles of Range Management ⁶
ASCI 384	Processed Meat Products ⁶
ASCI 412	Advanced Livestock Event Planning
ASCI 415	HACCP for Meat and Poultry Operations ⁶
POLS 338	Critical Issues in American Politics
POLS 351	Public Policy and Administration

¹ ASCI 490 may be substituted for ASCI 290.

² Required in Support; also satisfies GE.

³ CHEM 212 accepted in lieu of CHEM 312, but not for upper division credit.

⁴ MATH 116 and MATH 117 substitute.

⁵ A maximum of 6 units of CR/NC courses may be counted toward approved electives.

⁶ If any of these courses is taken to meet a major/support requirement, it cannot be double-counted as an approved elective.

General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	

Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		56

¹ Required in Support; also satisfies GE

BS Dairy Science Program Learning Objectives

1. Technical competency within the disciplines of Dairy Science (Dairy Husbandry and Dairy Products Technology), with particular emphasis on the science, industry and practice.
2. Effective communication skills and leadership.
3. An advanced level of critical thinking skills and problem solving capability.
4. The capability of maintaining consistent, professional behavior and performance in a rapidly changing work environment.
5. Strong awareness of society as a whole and of agriculture's place in society.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

ASCI 101	Introduction to the Animal Sciences	2
ASCI 220	Introductory Animal Nutrition and Feeding	4
or ASCI 211	Meat Science	
ASCI 340	Animal Welfare and Ethics	4
ASCI 363	Undergraduate Seminar	2
DSCI 102	Dairy Operations and Safety	2
or ASCI 339	Internship in Animal Science	
DSCI 202	Dairy Promotion and Marketing	4
DSCI 230	General Dairy Husbandry	4

DSCI 231	General Dairy Manufacturing	4
DSCI 233	Milk Processing and Inspection	4
DSCI 241	Dairy Cattle Selection, Breeds, Fitting and Showing	4
or FSN 275	Elements of Food Safety	
DSCI 301	Dairy Cattle Nutrition	4
or DSCI 401	Physical and Chemical Properties of Dairy Products	
DSCI 321	Lactation Physiology	4
or DSCI 444	Dairy Microbiology	
or MCRO 421	Food Microbiology	
DSCI 330	Artificial Insemination and Embryo Biotechnology	4
or DSCI 434	Cheese and Fermented Dairy Foods	
DSCI 333	Dairy Animal Health, Safety and Applied Technology	4
or DSCI 402	Quality Assurance and Control of Dairy Products	
DSCI 422	Breeding and Genetics of Dairy Cattle	4
or DSCI 435	Concentration and Fractionation Technology	
DSCI 432	Advanced Dairy Herd Management	4
or DSCI 433	Dairy Plant Management and Equipment	
DSCI 461	Senior Project	3
or ASCI 479	Senior Project - Current Topics in Animal Science	

SUPPORT COURSES

BIO 111	General Biology (B2 & B4) ^{1,2}	4
or BIO 161	Introduction to Cell and Molecular Biology	
CHEM 111	Survey of Chemistry (B3 & B4) ^{1,2}	4-5
or CHEM 127	General Chemistry for Agriculture and Life Science I	
MATH 118	Precalculus Algebra (B1) ^{1,3}	4
MCRO 221	Microbiology ¹	4
STAT 218	Applied Statistics for the Life Sciences (B1) ¹	4

Approved electivesAt least 15 units must be 300-400 level ⁴Consult with academic advisor regarding career tracks ⁵

Select from the following: 38

AEPS 150	Forage Crops
AEPS 230	Environmental Horticulture
AEPS 250	California Fruit Growing
AEPS 260	Introduction to Vegetable Science
AGB 212	Agricultural Economics
AGB 214	Agribusiness Financial Accounting
AGB 301	Food and Fiber Marketing
AGB 310	Agribusiness Credit and Finance
AGB 369	Agricultural Personnel Management
AGED 102	Introduction to Agricultural Education
AGED 404	Agricultural Leadership
ASCI 112	Principles of Animal Science
ASCI 221	Introduction to Beef Production
ASCI 226	Livestock Evaluation
ASCI 229	Anatomy and Physiology of Farm Animals
ASCI 290	Animal Production and Management Enterprise

ASCI 304	Animal Genomics
ASCI 310	Technical Veterinary Skills
ASCI 311	Advanced Beef Cattle System Management
ASCI 312	Production Medicine
ASCI 351	Reproductive Physiology
ASCI 366	Veterinary Pharmacology
ASCI 405	Domestic Livestock Endocrinology
ASCI 406	Applied Animal Embryology and Assisted Reproduction
ASCI 407	Assisted Reproduction Technologies of Gametes and Embryos Laboratory
ASCI 410	Applied Animal Behavior Science
ASCI 420	Animal Metabolism and Nutrition
ASCI 438	Systemic Animal Physiology
ASCI 440	Immunology and Diseases of Animals
ASCI 490	Advanced Animal Production and Management Enterprise
BIO 162	Introduction to Organismal Form and Function
BIO 303	Survey of Genetics
BRAE 121	Agricultural Mechanics
BRAE 141	Agricultural Machinery Safety
BUS 212	Financial Accounting for Nonbusiness Majors
CHEM 128	General Chemistry for Agriculture and Life Science II
CHEM 129	General Chemistry for Agriculture and Life Science III
CHEM 216	Organic Chemistry I
CHEM 217	Organic Chemistry II
CHEM 312	Survey of Organic Chemistry
CHEM 313	Survey of Biochemistry and Biotechnology
CHEM 371	Biochemical Principles
COMS 301	Business and Professional Communication
Any DSCI course	
FSN 125	Introduction to Food Science
FSN 230	Elements of Food Processing
FSN 275	Elements of Food Safety
FSN 311	Sensory Evaluation of Food
FSN 330	Introduction to Principles of Food Engineering
FSN 335	Food Quality Assurance
FSN 370	Food Plant Sanitation and Prerequisite Programs
JOUR 203	News Reporting and Writing
JOUR 205	Agricultural Communications
MCRO 342	Public Health Microbiology
MCRO 421	Food Microbiology
NR 141	Introduction to Forest Ecosystem Management

PHYS 121	College Physics I	
PHYS 122	College Physics II	
STAT 313	Applied Experimental Design and Regression Models	
Any courses used in the following minors:		
Agribusiness		
Agricultural Communication		
Crop Science		
Environmental Soil Science		
Equine Science		
Food Science		
Poultry Management		
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		56
FREE ELECTIVES		
Free Electives		4-5
Total units		180

¹ Required in Support; also satisfies GE.

² Students focusing on Dairy Foods should take BIO 161, and CHEM 127.

³ MATH 116 and MATH 117 substitute.

⁴ Courses used to meet Major requirements may not double count as approved electives.

⁵ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	

D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		56

¹ Required in Support; also satisfies GE

Dairy Industries Minor

Required Courses

DSCI 230	General Dairy Husbandry	4
DSCI 231	General Dairy Manufacturing	4

Approved Electives

Select one of the following emphasis areas (at least 13 units must be at the 300-400 level): ¹

Dairy Husbandry Area		
ASCI 220	Introductory Animal Nutrition and Feeding	
DSCI 102	Dairy Operations and Safety	
DSCI 202	Dairy Promotion and Marketing	
DSCI 241	Dairy Cattle Selection, Breeds, Fitting and Showing	
DSCI 270	Selected Topics	
DSCI 301	Dairy Cattle Nutrition	
DSCI 321	Lactation Physiology	
DSCI 330	Artificial Insemination and Embryo Biotechnology	
DSCI 333	Dairy Animal Health, Safety and Applied Technology	
DSCI 410	Advanced Dairy Nutrition	
DSCI 412	Dairy Farm Consultation	
DSCI 422	Breeding and Genetics of Dairy Cattle	
DSCI 432	Advanced Dairy Herd Management	
DSCI 470	Selected Advanced Topics	

Dairy Foods Area

CHEM 312	Survey of Organic Chemistry	
CHEM 313	Survey of Biochemistry and Biotechnology	
DSCI 202	Dairy Promotion and Marketing	
DSCI 233	Milk Processing and Inspection	
DSCI 401	Physical and Chemical Properties of Dairy Products	
DSCI 402	Quality Assurance and Control of Dairy Products	
DSCI 433	Dairy Plant Management and Equipment	
DSCI 434	Cheese and Fermented Dairy Foods	
DSCI 435	Concentration and Fractionation Technology	
DSCI 444	Dairy Microbiology	

or MCRO 421	Food Microbiology	
FSN 275	Elements of Food Safety	
or FSN 375	Food Safety	
MCRO 221	Microbiology	
Total units		26

¹ As a science-based minor, it is assumed that students have completed college introductory courses in biology, chemistry and statistics. In addition, some upper division courses may require microbiology, organic chemistry and/or biochemistry.

Equine Science Minor

Required Courses

ASCI 220	Introductory Animal Nutrition and Feeding	4
ASCI 224	Equine Science	4
ASCI 315	Equine Biomechanics	3-4
or ASCI 347	Equine Exercise Physiology	
ASCI 333	Equine Reproduction	5
ASCI 346	Equine Nutrition	4
Select from the following:		7
(May not include courses taken as required courses)		
ASCI 214	Equine Management	
ASCI 228	Equine Evaluation	
ASCI 315	Equine Biomechanics	
ASCI 324	Advanced Equine Evaluation	
ASCI 329	Principles of Range Management	
ASCI 339	Internship in Animal Science	
ASCI 344	Equine and Human Communication	
ASCI 345	Equine Behavior Modification	
ASCI 347	Equine Exercise Physiology	
ASCI 490	Advanced Animal Production and Management Enterprise	
Total units		27-28

Meat Science and Processing Minor

Prerequisite: One quarter of chemistry.

Required Courses

ASCI 211	Meat Science	4
ASCI 384	Processed Meat Products	4
or ASCI 330	Poultry Meat Production and Processing	
ASCI 415	HACCP for Meat and Poultry Operations	3
MCRO 221	Microbiology	4

Selected Courses

Select from the following: 12-15

7 units must be at upper-division level

ASCI 112	Principles of Animal Science	
ASCI 226	Livestock Evaluation	
ASCI 290	Animal Production and Management Enterprise	
ASCI 339	Internship in Animal Science	

ASCI 450	Computer Applications in Animal Science: Spreadsheet Analysis	
ASCI 479	Senior Project - Current Topics in Animal Science	
ASCI 490	Advanced Animal Production and Management Enterprise	
AG/ASCI 360	Holistic Management	
DSCI 444	Dairy Microbiology	
FSN 125	Introduction to Food Science	
or FSN 230	Elements of Food Processing	
FSN 370	Food Plant Sanitation and Prerequisite Programs	
MCRO 421	Food Microbiology	
Any upper-division AGB course		
Total units		27-30

Poultry Management Minor

Required Courses

ASCI 225	Introduction to Poultry Management	4
ASCI 325	Egg Production, Processing and Distribution	4
ASCI 330	Poultry Meat Production and Processing	4
ASCI 342	Poultry Business Management	4
ASCI 350	Nonruminant Nutrition	4
ASCI 415	HACCP for Meat and Poultry Operations	3

Approved Electives

Select from the following: 4

AGB 310	Agribusiness Credit and Finance	
ASCI 290	Animal Production and Management Enterprise	
or ASCI 490	Advanced Animal Production and Management Enterprise	
ASCI 339	Internship in Animal Science	
BUS 212	Financial Accounting for Nonbusiness Majors	
BUS 346	Principles of Marketing	
ENGL 310	Corporate Communication	
FSN 275	Elements of Food Safety	
FSN 334	Food Packaging	
FSN 335	Food Quality Assurance	
FSN 370	Food Plant Sanitation and Prerequisite Programs	
Total units		27

MPS Dairy Products Technology

Program Learning Objectives

After successfully completing the Master of Professional Studies in Dairy Product Technology, students will be able to:

1. Demonstrate mastery of the technical foundation knowledge necessary to enter a management role in large-scale global dairy foods manufacturing organizations.

- Chemistry, biochemistry and the chemical changes that occur in dairy foods induced by processing
- Analytical chemistry and instrumentation
- Microbiology and its role in both food processing and food safety
- Dairy foods ingredient functionality
- Food safety, quality assurance and control
- Sanitary design and cleaning
- Raw materials receiving and control
- Food laws and regulations
- Food sensory evaluation and process quality
- Unit operations in dairy foods processing

2. Employ leadership principles and recognize importance of leadership in management.

3. Apply critical thinking and analytical skills to solve problems, evaluate alternatives, synthesize solutions, and predict outcomes in a large dairy food production environment.

4. Develop a strong awareness of the dairy foods industry's place in society and can apply that awareness to formulate plans that benefit their company and society.

Required Courses

DSCI 501	Dairy Chemistry	3
DSCI 502	Dairy Chemistry Laboratory	2
DSCI 510	Dairy Foods: Issues and Practices	2
DSCI 520	Dairy Processing and Manufacturing I	3
DSCI 521	Dairy Processing and Manufacturing II	4
DSCI 524	Dairy Processing and Manufacturing III	4
DSCI 535	Dairy Foods Ingredient Functionality	4
DSCI 539	Graduate Internship in Dairy Science	4
DSCI 540	Graduate Dairy Microbiology	4
DSCI 541	Quality Assurance, Quality Control and Food Safety	4
DSCI 565	Industrial Plant Considerations for Sustainable Operation	4
DSCI 581	Graduate Seminar in Dairy Science (1, 1)	3
DSCI 582	Dairy Processing and Plant Management (2, 2)	4
Total units		45

BioResource & Agricultural Engineering

BioResource & Agricultural Engineering Bldg. (08), Room 101
Phone: 805.756.2378; Fax: 805.756.2626
<https://brae.calpoly.edu>

Department Head: Peter Livingston

Academic Programs

Program name	Program type
Agricultural Systems Management	BS
BioResource and Agricultural Engineering	BS

The department offers two programs leading to a Bachelor of Science degree: BioResource and Agricultural Engineering and Agricultural Systems Management.

The BioResource and Agricultural Engineering Department is an engineering-based educational organization consisting of professionals whose mission is the study, teaching, and practice of engineering and systems management support for agriculture. The department is nationally recognized as a leader in this field, and for balancing theory with application and principle with practice.

Department facilities include well-equipped laboratories for hydraulic systems, evaluation and testing of power units, fabrication of agricultural machinery, agricultural electrical systems, design and construction of agricultural structures, photogrammetry, microcomputers and controllers.

Outdoor facilities include a water resources center with multiple pumping systems and operational canals, a field for evaluation of various irrigation systems including an operating linear move and land for experience in the mechanical production of farm products and safe operation of agricultural machinery.

Students are encouraged to participate in the student clubs of the department. The Agricultural Engineering Society is involved in a broad range of activities and services including Open House displays. The student branch of the American Society of Agricultural and Biological Engineers offers professional and co-curricular activities.

Undergraduate Programs

BS Agricultural Systems Management

The mission of the Agricultural Systems Management program is to provide a "learn by doing" undergraduate educational experience that prepares students for systems management practice in support of agriculture and related industries throughout the West.

Students receive broad agricultural training with a business and management emphasis in one of the following areas: plant production, livestock production, food and fiber processing, environmental information management, water/irrigation, and processing and manufacturing. Students have the opportunity to develop management expertise through interdisciplinary experiences in agricultural technology and business oriented coursework.

The objectives of the Agricultural Systems Management program are to produce graduates who, in 3-5 years after graduation, are successful as one of the following:

- Individuals that are successful in technical, business, or management positions within agriculture or related industries
- Applying unique engineering problem-solving skills and principles so that they are "industry ready" to undertake technological, business, or management projects and make significant contributions from day one on the job
- Actively pursuing professional development such as a degree in an advanced degree program, professional license, or technical certification

Agricultural Systems Management graduates demonstrate a knowledge and understanding of basic agricultural technologies and agribusiness principles necessary for technical operations and business management careers in agriculture and related industries; an understanding of modern science and practice within a specialized agricultural area of interest; and ability to apply quantitative, analytical processes for developing solutions to technological, business or management problems associated with production, processing, or the distribution of products and support services in agriculture and related industries; an understanding of the interconnected "systems" of agriculture; and ability to safely and properly handle the materials, machines, sensors, tools and techniques of modern agricultural or technical operations; and an ability to communicate and perform as effective agricultural systems management professionals in the solution of problems crossing discipline or cultural boundaries.

Career opportunities are available in the manufacturing, sales, and service of agricultural equipment and machinery; management and production of animals and crops; processing of food and fiber; and management of water/irrigation facilities. The program is recognized by the American Society of Agricultural and Biological Engineers.

BS BioResource and Agricultural Engineering

The bioresource/agricultural engineer represents the most general type of engineer, adept at utilizing electrical and mechanical energy sources, water resources, and designing structural units. The curriculum features a unique combination of engineering and applied science coursework, with a focus on preparing graduates for practice in professional engineering.

The mission of the BioResource and Agricultural Engineering program is to provide a "learn by doing" undergraduate educational experience that prepares students for engineering practice in support of agriculture and related industries throughout the West.

The objectives of the BioResource and Agricultural Engineering program are to produce graduates who, in 3-5 years after graduation, are successful as one of the following:

- Engineers in positions of professional responsibility and leadership in a modern multi-disciplinary, system-oriented environment that emphasizes problem solving
- Actively pursuing professional development such as a degree in an advanced degree program, professional license, or technical certification

- Applying unique engineering problem-solving skills and principles within a career outside traditional engineering environments, such as management, teaching, research, or other professional fields

BioResource and Agricultural Engineering graduates demonstrate a knowledge and understanding of the basic mathematics, physical and engineering sciences necessary for modern agricultural engineering practice; the ability to design components, systems or processes to meet specified objectives, including prudent use of resources; an understanding of their professional and ethical responsibilities as agricultural engineers, including the societal impact of engineering solutions and the need to engage in life-long learning; the ability to plan, design, execute and evaluate engineering solutions to problems/projects that are real, practical and of a complexity representative of projects encountered in beginning professional practice; and the ability to communicate and perform as effective engineering professionals in both individual and team-based project environments.

Cal Poly's "learn by doing" philosophy is emphasized by the numerous design-centered laboratories and the senior project. In the senior design project, which is completed in a three-quarter set of capstone courses, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

Consistent with program accreditation requirements regarding a graduate's ability to function on multidisciplinary teams, the BioResource and Agricultural Engineering program has adopted an explicit graduation requirement in this area. This provides students an opportunity to practice team skills. Such experience is important for practicing engineers given the ever-increasing diversity of engineering science and applications. Methods to fulfill this requirement include items such as:

- Team design project
- CO-OP or internship employment
- Certain club activities
- Working with faculty on a sponsored project
- Project embedded in curriculum
- Taking certain technical electives
- Service learning project

Career opportunities exist in the design, evaluation and management of systems – water resources, irrigation, drainage, groundwater, pumps, soil conservation; agricultural power and machinery; food processing; energy; and agricultural environments. The program is accredited by the Engineering Accreditation Commission of ABET (<http://www.abet.org>).

Minors

The department participates in offering interdisciplinary minors in Water Science and Geographic Information Systems. Please see College of Agriculture, Food and Environmental Sciences (p. 63) section for more information.

Graduate Program

Cal Poly offers the MS in Agriculture with specializations in BioResource and Agricultural Systems and in Irrigation, and the MS in Engineering with a specialization in Water Engineering. Please see College of Agriculture, Food and Environmental Sciences (p. 63) and College of Engineering (p. 196) sections for more information.

BS Agricultural Systems Management

Program Learning Objectives

1. An ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;
2. An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;
3. An ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;
4. An ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives;
5. An ability to function effectively as a member or leader on a technical team;
6. An ability to identify, analyze, and solve broadly-defined engineering technology problems;
7. An ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;
8. An understanding of the need for and an ability to engage in self-directed continuing professional development;
9. An understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity;
10. A knowledge of the impact of engineering technology solutions in a societal and global context; and
11. A commitment to quality, timeliness, and continuous improvement.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

BRAE 128	Careers in Bioresource and Agricultural Engineering	2
BRAE 129	Laboratory Skills and Safety	1
BRAE 133	Introduction to Engineering Design Graphics	1
BRAE 142	Agricultural Power and Machinery Management	4
BRAE 151	CAD for Agricultural Engineering	1
BRAE 152	3-D Solids Modeling	1
BRAE 203	Agricultural Systems Analysis	4
BRAE 237	Introduction to Engineering Surveying	2-4

or BRAE 239	Engineering Surveying	
BRAE 301	Hydraulic and Mechanical Power Systems	4
BRAE 321	Agricultural Safety	3
BRAE 324	Principles of Agricultural Electrification	4
BRAE 340	Irrigation Water Management	4
BRAE 342	Agricultural Materials	4
BRAE 343	Mechanical Systems Analysis	4
BRAE 348	Energy for a Sustainable Society (Area F) ¹	4
BRAE 418	Agricultural Systems Management I	4
BRAE 419	Agricultural Systems Management II	4
BRAE 425	Computer Controls for Agriculture	3
BRAE 432	Agricultural Buildings	4
BRAE 438	Drip/Micro Irrigation	4
or BRAE 440	Agricultural Irrigation Systems	
BRAE 460	Senior Project Organization	1
BRAE 461	Senior Project I	2
BRAE 462	Senior Project II ³	2

Approved Electives ²

See Approved Electives below 14

SUPPORT COURSES

AGB 212	Agricultural Economics	4
AGB 301	Food and Fiber Marketing	4
AGB 310	Agribusiness Credit and Finance	4
AGB 369	Agricultural Personnel Management	4
BUS 212	Financial Accounting for Nonbusiness Majors	4
or AGB 214	Agribusiness Financial Accounting	
CHEM 110	World of Chemistry (B3&B4) ¹	4
or CHEM 127	General Chemistry for Agriculture and Life Science I	
ENGL/COMS 145	Reasoning, Argumentation, and Writing (A3) ¹	4
or ENGL 148	Reasoning, Argumentation and Professional Writing	
Select from the following:		4
MATH 119	Precalculus Trigonometry (B1) ¹	
STAT 217	Introduction to Statistical Concepts and Methods	
or STAT 218	Applied Statistics for the Life Sciences	
MATH 221	Calculus for Business and Economics (B1)	4
PHYS 121	College Physics I	4
SS 121	Introductory Soil Science	4

Animal or plant production course

Any AEPS, ASCI, DSCI course except for internship or enterprise courses. 3

GENERAL EDUCATION (GE)

(See GE program requirements below.) 52

FREE ELECTIVES

Free Electives 0

Total units 180-182

Approved Electives

Minimum of 6 units must be upper division

No more than 4 units of internship or enterprise may be used

Select from the following: 14

Any AGB course eligible for the Agribusiness minor	
AGED 102	Introduction to Agricultural Education
BRAE 200	Special Problems for Undergraduates (4 units maximum)
BRAE 236	Principles of Irrigation
BRAE 302	Servo Hydraulics
BRAE 331	Irrigation Theory
BRAE 335	Internal Combustion Engines
BRAE 337	Landscape Irrigation
BRAE 344	Fabrication Systems
BRAE 345	Aerial Photogrammetry and Remote Sensing
BRAE 400	Special Problems (4 units maximum)
BRAE 405	Chemigation
BRAE/EE 434	Automotive Engineering for a Sustainable Future
BRAE 435	Drainage
BRAE 438	Drip/Micro Irrigation
or BRAE 440	Agricultural Irrigation Systems
BRAE 447	Advanced Surveying with GIS Applications
BRAE 448	Bioconversion
BRAE 450	Solar Photovoltaic System Engineering
BRAE 532	Water Wells and Pumps
CHEM 212	Introduction to Organic Chemistry
FSN 125	Introduction to Food Science
FSN 204	Food Processing Operations
FSN 230	Elements of Food Processing
FSN 275	Elements of Food Safety
FSN 330	Introduction to Principles of Food Engineering
FSN 334	Food Packaging
FSN 341	Fermented Foods
FSN 354	Packaging Function in Food Processing
FSN 370	Food Plant Sanitation and Prerequisite Programs
FSN 375	Food Safety
FSN 444	Food Engineering
IME 141	Manufacturing Processes: Net Shape
IME 142	Manufacturing Processes: Materials Joining
IME 143	Manufacturing Processes: Material Removal
IME 144	Introduction to Design and Manufacturing
IME 157	Electronics Manufacturing

IME 319	Human Factors Engineering	
IME 320	Human Factors and Technology	
ITP 330	Packaging Fundamentals	
ITP 341	Packaging Polymers and Processing	
NR/LA 218	Introduction to Geographic Information Systems (GIS)	
NR 306	Natural Resource Ecology and Habitat Management	
NR/CRP 408	Water Resource Law and Policy	
NR 416	Environmental Impact Analysis and Management	
SS 221	Soil Health and Plant Nutrition	
Plant or Animal Production Course		
Any AEPS, ASCI, DSCI course except for internship or enterprise courses		
Total units		14

¹ Required in Major or Support; also satisfies GE.

² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

³ May substitute 2 units of any upper-division courses not used to satisfy the requirement in the major.

General Education (GE) Requirements

- 72 units required, 20 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4

Area F	Technology	
F	Upper-division elective (4 units in Major) ¹	0
Total units		52

¹ Required in Major or Support; also satisfies GE.

BS BioResource and Agricultural Engineering

Program Learning Outcomes

1. An ability to apply knowledge of mathematics, science, and engineering,
2. An ability to design and conduct experiments, as well as to analyze and interpret data,
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
4. An ability to function on multidisciplinary teams,
5. An ability to identify, formulate, and solve engineering problems,
6. An understanding of professional and ethical responsibility,
7. An ability to communicate effectively,
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context,
9. A recognition of the need for, and an ability to engage in life-long learning,
10. A knowledge of contemporary issues,
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

BRAE 128	Careers in Bioresource and Agricultural Engineering	2
BRAE 129	Laboratory Skills and Safety	1
BRAE 133	Introduction to Engineering Design Graphics	1
BRAE 151	CAD for Agricultural Engineering	1
BRAE 152	3-D Solids Modeling	1
BRAE 216	Fundamentals of Electricity	4
BRAE 232	Agricultural Structures Planning	4
BRAE 234	Introduction to Mechanical Systems in Agriculture	4

BRAE 236	Principles of Irrigation	4
BRAE 239	Engineering Surveying	4
BRAE 312	Hydraulics	4
BRAE 320	Principles of Bioresource Engineering	4
BRAE 328	Measurements and Computer Interfacing	4
BRAE 331	Irrigation Theory	3
BRAE 403	Agricultural Systems Engineering	4
BRAE 414	Irrigation Engineering	4
BRAE 421	Equipment Engineering	3
BRAE 422	Equipment Engineering	4
BRAE 428	Agricultural Robotics and Automation	4
BRAE 433	Agricultural Structures Design	4
BRAE 460	Senior Project Organization	1
BRAE 461	Senior Project I	2
BRAE 462	Senior Project II ³	2

Approved Electives ¹

Select from the following: 5-7

BRAE 302	Servo Hydraulics
BRAE 335	Internal Combustion Engines
BRAE 345	Aerial Photogrammetry and Remote Sensing
BRAE 348	Energy for a Sustainable Society
BRAE 400	Special Problems (4 units maximum)
BRAE 405	Chemigation
BRAE/EE 434	Automotive Engineering for a Sustainable Future
BRAE 435	Drainage
BRAE 447	Advanced Surveying with GIS Applications
BRAE 448	Bioconversion
BRAE 450	Solar Photovoltaic System Engineering
BRAE 532	Water Wells and Pumps
BRAE 533	Irrigation Project Design
CHEM 312	Survey of Organic Chemistry
IME 319	Human Factors Engineering
MCRO 421	Food Microbiology

any upper division CE course

any upper division EE course

any upper division ENVE course

any upper division ME course

SUPPORT COURSES

Select from the following: 4

BIO 213 & BRAE 213	Life Science for Engineers and Bioengineering Fundamentals (also offered as BMED 213; B2) ²	
MCRO 221	Microbiology (B2) ²	
CE 204	Mechanics of Materials I	3
CE 207	Mechanics of Materials II	2
CHEM 124	General Chemistry for Physical Science and Engineering I (B3 & B4) ²	4

CHEM 125	General Chemistry for Physical Science and Engineering II (Add'l Area B) ²	4
----------	---	---

Select from the following: 2-3

CSC 231	Programming for Engineering Students	
or CSC 232	Computer Programming for Scientists and Engineers	
or CSC 234	C and Unix	

ECON 201	Survey of Economics (D2) ²	4
or ECON 222	Macroeconomics	

EE 321 & EE 361	Electronics and Electronics Laboratory	4
--------------------	--	---

ENGL 149	Technical Writing for Engineers (A3) ²	4
----------	---	---

MATH 141	Calculus I (B1) ²	4
----------	------------------------------	---

MATH 142	Calculus II (B1) ²	4
----------	-------------------------------	---

MATH 143	Calculus III (Add'l Area B) ²	4
----------	--	---

MATH 241	Calculus IV	4
----------	-------------	---

MATH 244	Linear Analysis I	4
----------	-------------------	---

ME 211	Engineering Statics	3
--------	---------------------	---

ME 212	Engineering Dynamics	3
--------	----------------------	---

PHYS 141	General Physics IA	4
----------	--------------------	---

PHYS 132	General Physics II	4
----------	--------------------	---

PHYS 133	General Physics III	4
----------	---------------------	---

SS 121	Introductory Soil Science	4
--------	---------------------------	---

STAT 312	Statistical Methods for Engineers (B6) ²	4
----------	---	---

GENERAL EDUCATION (GE)

(See GE program requirements below.) 36

FREE ELECTIVES

Free Electives 0

Total units 187-190

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² Required in Support; also satisfies GE.

³ May substitute 2 units of any upper-division courses not used to satisfy the requirement in the major.

General Education (GE) Requirements

- 72 units required, 36 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics ^{no additional units are required}	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0

B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy (4 units in Support) ¹	0
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		36

¹ Required in Support; also satisfies GE

Experience Industry Management

Agricultural Sciences Bldg. (11), Room 261

Phone: 805.756.1288

<https://eim.calpoly.edu>

Department Head: William W. Hendricks

ACADEMIC PROGRAMS

Program name	Program type
Event Planning and Experience Management	Minor
Recreation, Parks, & Tourism Administration	BS

The Experience Industry is a cornerstone of American culture and critical to both the United States and global economies. Globally, the experience industry sees approximately \$980 billion in spending; in the United States, international tourism generates approximately \$240 billion and the US is consistently ranked as one of the top tourism earners in the world. The experience industry includes (but is not limited to) event planning, sport management, travel, hospitality, tourism, destination management, leisure, and parks and recreation, providing structured and co-created experiences that contribute to quality of life, economic vitality, sustainability, and social equity. The industry offers numerous experience management employment opportunities, both in the United States and abroad.

Students are prepared for professional employment in destination management and marketing, corporate, mega, and social event planning, sport promotion and game-day operations, experiential marketing, hospitality management, tourism operations, park management, community recreation, employee experiences, outdoor recreation leadership, and convention and meeting management. Students select a concentration in event planning and experience management; tourism, hospitality, and destination management; and sport and recreation experience management.

To prepare students for their professional careers, the major includes a required 400-hour internship (one quarter) with an organization within the experience industry management umbrella. Students must also complete 1,000 hours of paid or volunteer experience prior to the internship.

Graduates employed nationally and internationally strategize, design, create, plan, organize, execute and evaluate experience industry programs and services for visitors, guests, customers, and clients in a variety of settings. Management, marketing, and planning skills, developed through coursework and through practical, hands-on applications, allow for career progress into executive management positions within the experience industry.

Students develop those competencies through a myriad of partnerships developed by the department with local, state, national, and international organizations. These partnerships allow students, both in and out of the classroom, to gain valuable Learn by Doing experiences that set them apart from other entry-level professionals in the global market.

Undergraduate Program

BS Recreation, Parks, and Tourism Administration

The Experience Industry Management (EIM) department prepares students to be leaders in an industry that promotes healthy lifestyles,

protects memorable places, and facilitates life-enhancing experiences for individuals, communities, and the global society. The program is accredited by the Council on Accreditation of Parks, Recreation, Tourism and Related Professions (COAPRT).

In addition to major requirements, the curriculum provides a full range of general education and support courses. These courses are designed to fully educate and prepare students for cultural diversity, community engagement, and international understanding in a global society.

Concentrations

Event Planning & Experience Management

Prepares students for a professional career in experience design, event planning, leadership, and management for a variety of structured and co-created experiences, including festivals, celebrations, conventions, meetings, and expositions, social life-cycle events, mega and hallmark events, sporting, international, and non-profit events. Courses focus on strategic event planning, marketing, structured experience and co-created experience design, implementation, and management.

Sport & Recreation Experience Management

Prepares students for management positions with sport and recreation entities ranging from professional sport franchises to community nonprofit organizations to adventure recreation outlets and intercollegiate athletic programs. Career elective tracks include: Professional Sport and Intercollegiate Athletics, Adventure Sport and Outdoor Recreation, Coaching and Sports-Based Youth Development, and Community and Nonprofit Recreation. Areas of study include: sport marketing and promotions, sport and environmental ethics, leadership and facilitation, special event planning, sports-based youth development, community relations, grant funding and development, and coaching.

Tourism, Hospitality & Destination Management

Prepares students for a professional career with organizations that provide experience industry products or services for national and international tourists. Students may choose to emphasize in areas such as resort and lodging experience management, tourism planning and destination management, food and beverage experience management, tour operations, tourism, hospitality, and destination marketing, and entrepreneurship.

Event Planning & Experience Management Minor

This minor prepares students for a professional career in experience design, event planning, leadership, and management for a variety of event genres including corporate events, conventions, festivals, meetings, exhibitions, mega and hallmark events, sporting, international, and non-profit events. Principles of experience design, structured and co-created experiences will be explored. Courses focus on strategic event design, planning, implementation, and management. Not open to RPTA majors. See department head to apply.

BS Recreation, Parks, and Tourism Administration

Program Learning Objectives

At the completion of this degree program, EIM students will be able to:

1. Think critically and creatively.

2. Communicate effectively.
3. Demonstrate their expertise in the Experience Industry and its associated industries in relation to the larger world of arts, sciences, and technology.
4. Work productively as individuals and in groups.
5. Use their knowledge and skills to make a positive contribution to society.
6. Make reasoned decisions based on an understanding of ethics, a respect for diversity, and an awareness related to sustainability.
7. Engage in lifelong learning.
8. Demonstrate the following entry-level knowledge in the EIM field:
 - a) the nature and scope of the relevant park, recreation, tourism or related professions and their associated industries; b) techniques and processes used by professionals and workers in those industries; and c) the foundations of the profession in history, science, and philosophy (COAPRT Standard 7.01).
9. Demonstrate the ability to design, implement, and evaluate services that facilitate targeted human experiences and that embrace personal and cultural dimensions of diversity (COAPRT Standard 7.02).
10. Demonstrate entry-level knowledge about operations and strategic management/administration in parks, recreation, tourism and/or related professions (COAPRT Standard 7.03).
11. Demonstrate, through a comprehensive internship of not less than 400 clock hours and no fewer than 10 weeks, the potential to succeed as professionals at supervisory or higher levels in park, recreation, tourism, or related organizations (COAPRT Standard 7.04).

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

RPTA 101	Introduction to the Experience Industry	4
RPTA 110	Orientation and College Success in Experience Industry Management	1
RPTA 210	Experience Program Design	4
RPTA 221	Professionalism and Customer Experiences	4
RPTA 257	Leadership and Diverse Groups	4
RPTA 342	Risk Management for the Experience Industry	4
RPTA 360	Assessment and Evaluation of Experience Industry Management	4
RPTA 370	Experiential Marketing Strategies for Experience Industry Management	4
RPTA 405	Principles of Experience Industry Management	4

RPTA 424	Financial Management in the Experience Industry	4
RPTA 460	Senior Project in Experience Industry Management	4
RPTA 463	Pre-Internship Seminar	1
RPTA 465	Internship	12
Concentration or individualized course of study courses (see below) ⁴		24

SUPPORT COURSES

BUS 212	Financial Accounting for Nonbusiness Majors	4
or AGB 214	Agribusiness Financial Accounting	
BUS 215	Managerial Accounting	4
or AGB 323	Agribusiness Managerial Accounting	
BUS 346	Principles of Marketing	4
ECON 201	Survey of Economics (D2) ¹	4
or ECON 222	Macroeconomics	
ENGL 310	Corporate Communication	4
MATH 118	Precalculus Algebra (B1) ^{1,2}	4
or MATH 119	Precalculus Trigonometry	
or MATH 141	Calculus I	
or MATH 221	Calculus for Business and Economics	
STAT 217	Introduction to Statistical Concepts and Methods (B1) ¹	4
or STAT 251	Statistical Inference for Management I	

Support Electives

Select from the following: ^{3,4}	8
---	---

Leadership & Management

AGED 404	Agricultural Leadership
BUS 207	Legal Responsibilities of Business
BUS 310	Introduction to Entrepreneurship
BUS 384	Human Resources Management
BUS 387	Organizational Behavior
COMS/PSY 212	Interpersonal Communication
COMS 213	Organizational Communication
COMS 301	Business and Professional Communication
MSL 102	Foundation of Officership II
MSL 103	Basic Leadership
MSL 201	Foundations of Leadership I
MSL 202	Foundations of Leadership II
MSL 203	Foundations of Leadership III
RPTA 275	Facilitation and Teambuilding
RPTA 325	Leadership in Outdoor Experiences

Marketing, Technology, & Analytics

AGB 260	Agribusiness Data Literacy
AGB 327	Agribusiness Data Analysis
AGC 301	New Media Communication Strategies in Agriculture
BUS 382	Organizations, People, and Technology
BUS 418	Listening to the Customer
BUS 419	Strategic Marketing Measurement

BUS 421	Marketing Analytics and Business Intelligence
BUS 446	International Marketing
JOUR 312	Public Relations
STAT 252	Statistical Inference for Management II (B1)
UNIV 391	Appropriate Technology for the World's People: Development
WVIT 343	Branded Wine Marketing
WVIT 433	Wine Sales and E-Commerce
WVIT 444	Wine Marketing Research and Market Analysis

Sustainability & the Global Society

AG/EDES/ENGR/ GEOG/ISLA/ SCM/UNIV 350	The Global Environment
AG 360	Holistic Management (F)
ANT 312	Introduction to Cultural Resources Management
BRAE 348	Energy for a Sustainable Society (F)
BUS 302	International and Cross Cultural Management
CM 317	Sustainability and the Built Environment (F)
EDES 406	Sustainable Environments
GEOG 301	Geography of Resource Utilization (D5)
GEOG 325	Climate and Humanity
GEOG 333	Human Impact on the Earth
NR 323	Human Dimensions in Natural Resources Management (D5)
NR 404	Environmental Law
PHIL 340	Environmental Ethics (C4)
POLS/UNIV 333	World Food Systems
PSC 320	Energy, Society and the Environment (F)
PSY 311	Environmental Psychology (D5)
RPTA 112	Introduction to Parks and Outdoor Recreation
RPTA 302	Environmental and Wilderness Education
RPTA 313	Sustainability in the Experience Industry
RPTA 413	Tourism and Protected Area Management

GENERAL EDUCATION (GE)

(See GE program requirements below.) 60

FREE ELECTIVES

Free Electives	6
Total units	180

¹ Required in Support; also satisfies GE.

² MATH 116 and MATH 117 substitute.

³ Courses taken in the Support Elective area cannot double count in Concentration.

⁴ Some GE requirements may be met by course selections within the Support electives and/or concentration; in that case, additional free electives may be required to reach a total of 180 units.

Concentrations (Select one)

- Event Planning and Experience Management (p. 104)
- Sport & Recreation Experience Management (p. 104)
- Tourism, Hospitality and Destination Management (p. 106)

Individualized Course of Study

A minimum of 24 units of coursework, of which a minimum of 12 units must be RPTA prefix, and a minimum of 4 units must be Upper Division. Courses are selected by the student in consultation with the student's academic advisor, and the ICS must be approved by the academic advisor.

General Education (GE) Requirements

- 72 units required, 12 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy (4 units in Support) ¹	0
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		60

¹ Required in Support; also satisfies GE

Event Planning and Experience Management Concentration

RPTA 114	Introduction to Hospitality and Travel	4
RPTA 317	Hospitality, Convention and Meeting Management	4
RPTA 320	Strategic Event Planning	4
RPTA 420	Festival and Event Management	4
Approved electives ^{1,2}		
Select from the following, with a minimum of 4 units upper division:		8
AEPS 215	Floral Design I	
AEPS 225	Floral Design II	
BUS 207	Legal Responsibilities of Business	
BUS 418	Listening to the Customer	
BUS 419	Strategic Marketing Measurement	
BUS 421	Marketing Analytics and Business Intelligence	
COMS/PSY 212	Interpersonal Communication	
COMS 301	Business and Professional Communication	
COMS 419	Media Effects	
FSN 121	Fundamentals of Food	
FSN 210	Nutrition	
FSN 250	Food and Nutrition: Customs and Culture (D4) (USCP)	
FSN 275	Elements of Food Safety	
FSN 319	Food Technology for the Consumer (F)	
FSN 321	Contemporary Issues in Food Choice and Preparation	
FSN 341	Fermented Foods	
FSN 343	Institutional Foodservice I	
FSN 344	Institutional Foodservice II	
GRC 377	Web and Print Publishing (F)	
JOUR 312	Public Relations	
JOUR 331	Contemporary Advertising	
JOUR 342	Public Relations Writing and Editing	
KINE 181	First Aid/CPR/AED	
MSL/RPTA 275	Facilitation and Teambuilding	
RPTA 216	Resort and Lodging Operations	
RPTA 314	Sustainable Travel and Tourism Planning	
RPTA 318	Destination Management	
RPTA 321	Visitor Services in Experience Industry Management	
RPTA 323	Sport Promotions and the Fan Experience	
RPTA 330	Directed Field Experience	
RPTA 350	Sport and Event Venue Management	
RPTA 400	Special Problems for Advanced Undergraduates	
RPTA 412	Tourism and Outdoor Applications Seminar	

RPTA 450	Resource and Grant Development	
RPTA/NR 472	Leadership Practice	
STAT 252	Statistical Inference for Management II	
TH 230 or TH 330	Stagecraft I Stagecraft II	
WVIT 102	Global Wine and Viticulture	
WVIT 343	Branded Wine Marketing	
WVIT 344	Direct to Consumer Wine Sales	
WVIT 433	Wine Sales and E-Commerce	
WVIT 444	Wine Marketing Research and Market Analysis	

Total units 24

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² If any of these courses are taken to meet a support elective area requirement, they cannot be double-counted as a concentration advisor approved elective.

Sport & Recreation Experience Management Concentration

RPTA 160	Introduction to Sport Management	4
RPTA 260	Community Relations and Sports-Based Youth Development	4
RPTA/MSL 275	Facilitation and Teambuilding	2
RPTA 320	Strategic Event Planning	4

Approved electives^{1,2}

Select from the following, with a minimum of 4 units upper division: 10

Professional Sports & Intercollegiate Athletics

AEPS 343	Turfgrass Management	
AEPS 432	Specialized Operations for Golf Courses and Athletic Fields	
BUS 207	Legal Responsibilities of Business	
BUS 302	International and Cross Cultural Management	
BUS 310	Introduction to Entrepreneurship	
BUS 382	Organizations, People, and Technology	
BUS 384	Human Resources Management	
BUS 387	Organizational Behavior	
BUS 407	Managing People in Global Markets	
BUS 418	Listening to the Customer	
BUS 419	Strategic Marketing Measurement	
BUS 421	Marketing Analytics and Business Intelligence	
BUS 446	International Marketing	
COMS 213	Organizational Communication	
COMS 301	Business and Professional Communication	
ECON 221	Microeconomics	

GRC 377	Web and Print Publishing (F)
JOUR 331	Contemporary Advertising
JOUR 342	Public Relations Writing and Editing
KINE 266	Sport and Exercise Psychology
KINE 323	Sport and Gender (D5, USCP)
KINE 324	Sports, Media and American Popular Culture (D5, USCP)
RPTA 313	Sustainability in the Experience Industry
RPTA 321	Visitor Services in Experience Industry Management
RPTA 323	Sport Promotions and the Fan Experience
RPTA 330	Directed Field Experience
RPTA 350	Sport and Event Venue Management
RPTA 400	Special Problems for Advanced Undergraduates
RPTA 412	Tourism and Outdoor Applications Seminar
RPTA 420	Festival and Event Management
RPTA/NR 472	Leadership Practice

Adventure Sport & Outdoor Recreation

AEPS 437	Park and Public Space Management
KINE 181	First Aid/CPR/AED
MSL 111	Orienteering
NR 141	Introduction to Forest Ecosystem Management
NR 142	Environmental Management
NR/LA 218	Introduction to Geographic Information Systems (GIS)
RPTA 112	Introduction to Parks and Outdoor Recreation
RPTA 114	Introduction to Hospitality and Travel
RPTA/NR 203	Resource Law Enforcement
RPTA 302	Environmental and Wilderness Education
RPTA 313	Sustainability in the Experience Industry
RPTA 314	Sustainable Travel and Tourism Planning
RPTA 318	Destination Management
RPTA 321	Visitor Services in Experience Industry Management
RPTA 325	Leadership in Outdoor Experiences
RPTA 330	Directed Field Experience
RPTA 400	Special Problems for Advanced Undergraduates
RPTA 412	Tourism and Outdoor Applications Seminar
RPTA/NR 472	Leadership Practice
UNIV 350	The Global Environment (F)
UNIV 391	Appropriate Technology for the World's People: Development (D5)

Coaching & Sports-Based Youth Development

CD/PSY 256	Developmental Psychology
------------	--------------------------

KINE 181	First Aid/CPR/AED
KINE 266	Sport and Exercise Psychology
KINE 323	Sport and Gender
KINE 324	Sports, Media and American Popular Culture
RPTA 321	Visitor Services in Experience Industry Management
RPTA 323	Sport Promotions and the Fan Experience
RPTA 330	Directed Field Experience
RPTA 350	Sport and Event Venue Management
RPTA 400	Special Problems for Advanced Undergraduates
RPTA 412	Tourism and Outdoor Applications Seminar
RPTA 420	Festival and Event Management
RPTA/NR 472	Leadership Practice

Community & Nonprofit Recreation

AEPS 343	Turfgrass Management
AEPS 432	Specialized Operations for Golf Courses and Athletic Fields
AEPS 437	Park and Public Space Management
CD/PSY 256	Developmental Psychology
COMS 213	Organizational Communication
COMS 301	Business and Professional Communication
CRP 211	Cities: Form, Culture and Evolution
CRP 212	Introduction to Urban Planning
ECON 221	Microeconomics
GRC 377	Web and Print Publishing
JOUR 331	Contemporary Advertising
JOUR 342	Public Relations Writing and Editing
KINE 181	First Aid/CPR/AED
POLS 112	American and California Government
POLS 351	Public Policy and Administration
RPTA 321	Visitor Services in Experience Industry Management
RPTA 330	Directed Field Experience
RPTA 350	Sport and Event Venue Management
RPTA 400	Special Problems for Advanced Undergraduates
RPTA 412	Tourism and Outdoor Applications Seminar
RPTA 420	Festival and Event Management
RPTA 450	Resource and Grant Development
RPTA/NR 472	Leadership Practice

Total units	24
-------------	----

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² If any of these courses is taken to meet a support elective area requirement, it cannot be double-counted as an approved elective.

Tourism, Hospitality, and Destination Management Concentration

RPTA 114	Introduction to Hospitality and Travel	4
RPTA 216	Resort and Lodging Operations	4
RPTA 314	Sustainable Travel and Tourism Planning	4
RPTA 317	Hospitality, Convention and Meeting Management	4

Approved electives¹

Select from the following, with a minimum of 4 units upper division:²

Resort & Lodging Experience Management

AGB 260	Agribusiness Data Literacy
AGB 327	Agribusiness Data Analysis
AGC 301	New Media Communication Strategies in Agriculture
BUS 207	Legal Responsibilities of Business
BUS 302	International and Cross Cultural Management
BUS 382	Organizations, People, and Technology
BUS 418	Listening to the Customer
BUS 419	Strategic Marketing Measurement
BUS 421	Marketing Analytics and Business Intelligence
BUS 446	International Marketing
ECON 221	Microeconomics
GRC 377	Web and Print Publishing (F)
JOUR 312	Public Relations
PSC/UNIV 391	Appropriate Technology for the World's People: Development
RPTA 321	Visitor Services in Experience Industry Management
RPTA 330	Directed Field Experience
RPTA 350	Sport and Event Venue Management
RPTA 400	Special Problems for Advanced Undergraduates
RPTA 412	Tourism and Outdoor Applications Seminar
RPTA 450	Resource and Grant Development
RPTA/NR 472	Leadership Practice
STAT 252	Statistical Inference for Management II
WVIT 343	Branded Wine Marketing
WVIT 433	Wine Sales and E-Commerce

Tourism Planning & Destination Management

BUS 207	Legal Responsibilities of Business
BUS 302	International and Cross Cultural Management
BUS 310	Introduction to Entrepreneurship
BUS 418	Listening to the Customer
COMS 201	Advanced Public Speaking
CRP 212	Introduction to Urban Planning

CRP 214	Land Use and Transportation Studies
CRP/ES 215	Planning for and with Multiple Publics
CRP 334	Cities in a Global World (D5)
ECON 221	Microeconomics
GEOG 308	Global Geography (D5)
GRC 377	Web and Print Publishing (F)
JOUR 312	Public Relations
JOUR 331	Contemporary Advertising
JOUR 342	Public Relations Writing and Editing
PSY 201	General Psychology (D4)
PSY 212	Interpersonal Communication
PSY 252	Social Psychology
PSY 351	Group Dynamics
RPTA 318	Destination Management
RPTA 320	Strategic Event Planning
RPTA 321	Visitor Services in Experience Industry Management
RPTA 330	Directed Field Experience
RPTA 350	Sport and Event Venue Management
RPTA 400	Special Problems for Advanced Undergraduates
RPTA 412	Tourism and Outdoor Applications Seminar
RPTA 420	Festival and Event Management
RPTA 450	Resource and Grant Development
RPTA/NR 472	Leadership Practice
WVIT 343	Branded Wine Marketing
WVIT 433	Wine Sales and E-Commerce
WVIT 444	Wine Marketing Research and Market Analysis

Food and Beverage Experience Management

BUS 207	Legal Responsibilities of Business
BUS 302	International and Cross Cultural Management
BUS 310	Introduction to Entrepreneurship
BUS 418	Listening to the Customer
BUS 446	International Marketing
COMS 201	Advanced Public Speaking
ECON 221	Microeconomics
FSN 121	Fundamentals of Food
FSN 210	Nutrition (B5)
FSN 250	Food and Nutrition: Customs and Culture (D4, USCP)
FSN 275	Elements of Food Safety
FSN 319	Food Technology for the Consumer (F)
FSN 321	Contemporary Issues in Food Choice and Preparation
FSN 341	Fermented Foods
FSN 343	Institutional Foodservice I
FSN 344	Institutional Foodservice II
GRC 377	Web and Print Publishing (F)
JOUR 312	Public Relations

JOUR 331	Contemporary Advertising	
JOUR 342	Public Relations Writing and Editing	
RPTA 320	Strategic Event Planning	
RPTA 321	Visitor Services in Experience Industry Management	
RPTA 330	Directed Field Experience	
RPTA 350	Sport and Event Venue Management	
RPTA 400	Special Problems for Advanced Undergraduates	
RPTA 412	Tourism and Outdoor Applications Seminar	
RPTA 420	Festival and Event Management	
RPTA 450	Resource and Grant Development	
RPTA/NR 472	Leadership Practice	
WVIT 102	Global Wine and Viticulture	
WVIT 343	Branded Wine Marketing	
WVIT 344	Direct to Consumer Wine Sales	
WVIT 433	Wine Sales and E-Commerce	
WVIT 444	Wine Marketing Research and Market Analysis	
Total units		24

RPTA 450	Resource and Grant Development
Total units	24

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² If any of these courses is taken to meet a support elective area requirement, it cannot be double-counted as an approved elective.

Event Planning and Experience Management Minor

Required Courses

RPTA 317	Hospitality, Convention and Meeting Management	4
RPTA 320	Strategic Event Planning	4
RPTA 370	Experiential Marketing Strategies for Experience Industry Management	4
RPTA 420	Festival and Event Management	4

Approved electives

Select from the following:		8
RPTA 160	Introduction to Sport Management	
RPTA 216	Resort and Lodging Operations	
RPTA 221	Professionalism and Customer Experiences	
RPTA 275	Facilitation and Teambuilding	
RPTA 318	Destination Management	
RPTA 321	Visitor Services in Experience Industry Management	
RPTA 323	Sport Promotions and the Fan Experience	
RPTA 350	Sport and Event Venue Management	
RPTA 412	Tourism and Outdoor Applications Seminar	

Food Science & Nutrition

Agricultural Sciences Bldg. (11), Room 244
Phone: 805.756.2660
<https://fsn.calpoly.edu>

Department Head: Johan Ubbink

Academic Programs

Program name	Program type
Food Science	BS, Minor
Nutrition	BS, Minor, MS

The department offers two bachelor's degrees and a master's degree. The bachelor's degrees are designed to prepare graduates for employment in the general areas of food science and human nutrition while the master's degree in Nutrition is designed to prepare graduates for advancement, specialization, and leadership in nutrition or healthcare careers.

Graduates with a bachelor of science in Food Science enjoy rewarding careers in food processing and product development, sales, research, quality assurance and government regulation. Graduates with a bachelor of science in Nutrition enjoy rewarding careers in dietetics and clinical nutrition, healthcare (medicine, dentistry, nursing, physician assistant, and chiropractic), public health, food industry, food systems management and education. Opportunities for private consulting and entrepreneurship are available to graduates in both majors. The department also offers minors in Food Science and Nutrition.

Students are involved in a number of clubs and teams, including the Food Science Club and Nutrition Club. Club activities involve a wide range of social, professional and service projects. Clubs provide opportunity for leadership training and participation in professional societies and organizations. Our students compete on teams in regional and national scholastic competitions such as Food Product Development teams and Nutrition and Food Science or Nutrition Quiz Bowl teams.

Learn by Doing in Food Science and Nutrition

The department is equipped with a food processing pilot plant, and laboratories for food safety, food chemistry, nutritional science, metabolism, and culinary science. These facilities are designed for teaching courses in nutrition, foodservice management, sensory evaluation of foods, food chemistry, food product development, food processing and quality control. Students get hands-on experience with pilot scale commercial processing equipment.

Students can manufacture and market various food products, which are sold throughout the community. Projects are designed to simulate industry and business practices. Classroom learning in nutrition is complemented with opportunities for service, outreach and research in the community. Students are encouraged to gain valuable experience by working during the summer or by participating in internship programs.

Dietetic Internship

Cal Poly's post-baccalaureate dietetic internship is accredited by the Accreditation Council for Education in Nutrition and Dietetics (ACEND) of the Academy of Nutrition and Dietetics. This competitive program consists of at least 1,200 hours of supervised practice and at least 108 hours of class, seminars, and professional meetings. Upon completion, interns must pass a national examination administered

by the Commission of Dietetic Registration to qualify as a Registered Dietitian (R.D.). Applications for fall quarter are due mid-February.

Undergraduate Programs

BS Food Science

The program is designed to prepare students for employment in the food industry, government and for graduate study. Principal areas of instruction are food engineering, food processing, food safety and sanitation, quality assurance, food microbiology, food chemistry and analysis, product development, and sensory evaluation. Employment opportunities are strong in each of these areas.

Concentrations

Advanced Food Science

The Advanced Food Science Concentration in BS Food Science is the curriculum approved by the Institute of Food Technologists (IFT.org (<http://www.ift.org>)), the key international professional society for food scientists. Students are strongly advised to follow this concentration if they anticipate graduate study following completion of the BS. Students enrolled in this concentration are eligible for IFT scholarships.

Applied Food Technology

The Applied Food Technology Concentration in BS Food Science allows students to select coursework focused in a commodity or other area where they have career interest. For example, with proper selection of approved electives and concentration area courses, students may earn minors in nutrition or packaging. Course selections could also focus in dairy products, culinary science, or agribusiness.

Culinary

is designed for students wanting to apply a strong science background in ingredient development, food product development, or in entrepreneurial pursuits. This concentration serves the need for food scientists who are positioned to make decisions that require a blend of management training, culinary expertise, and a technical science background. Graduates are prepared to pursue advanced degrees in food science or may choose to attend a professional culinary program.

BS Nutrition

The program offers a broad preparation in nutritional science. In addition to preparatory science courses such as chemistry and biology, the program offers coursework in nutrient metabolism, clinical nutrition, community nutrition, and lifecycle nutrition, foods and food system management.

Concentrations

Applied Nutrition

Applied Nutrition prepares students for careers in various areas of nutrition, including dietetics, food systems management, nutrition communications, and community nutrition. This concentration is a Didactic Program in Dietetics (DPD), accredited by the Accreditation Council for Education in Nutrition and Dietetics (ACEND), of the Academy of Nutrition and Dietetics, 120 Riverside Plaza, Suite 2000, Chicago, IL 60606-6995, (800) 877-1600 Ext. 5400. Students in this concentration who graduate with a minimum higher education overall GPA of 2.75 and receive a Verification Statement are eligible to apply for admission to an accredited dietetic internship, upon completion of which the graduate must pass a national examination administered by the Commission on Dietetic Registration to qualify as a registered dietitian (RD). Graduates

also are prepared to pursue advanced degrees in foods and nutrition, public health, and food systems management.

Nutrition and Food Industries

Nutrition and Food Industries is designed for students who want to apply knowledge of nutrition to careers in the food industry and related organizations (such as commodity and other non-profit organizations, pharmaceutical companies, or government). A Food Science or Agricultural Communications minor can be earned with proper course selection within this concentration and within the 180 unit degree requirement. Students are prepared for positions in food product research and development, quality and regulatory operations, food and health communications, public relations, extension, and technical sales. In addition, students are prepared for graduate study in food science, nutrition, or related fields.

Nutrition Science

Nutrition Science emphasizes a strong background in basic sciences and human nutrition for students planning further study in graduate school or a health-related profession such as medicine, dentistry, nursing, pharmacy or physical therapy. Students need to check with their advisors for specific requirements for various health-related professions.

Minors

The department offers minors in either food science or nutrition to qualified students from across campus. Specific criteria apply to entering into the minor program and interested students should see either of the minor advisors.

Food Science Minor

The minor is principally designed for students majoring in related academic disciplines who desire employment in the food industry. Students acquire the fundamental technical skills necessary to understand basic issues and concepts in food science such as food processing, food safety, and quality assurance. See the department Food Science minor coordinator for criteria for admission into the Food Science minor.

Nutrition Minor

The minor is designed for students majoring in science disciplines (Chemistry, Biological Sciences, Kinesiology), Agribusiness or Agricultural Communications, and other interested majors such as Business or Psychology. Students can enhance career opportunities or qualification for admission into graduate programs or allied health fields. See the department Nutrition minor coordinator for criteria for admission into the Nutrition minor.

Interdisciplinary Minors

The department participates in offering interdisciplinary minors in Packaging (see Orfalea College of Business (p. 172) section).

Graduate Programs

Cal Poly offers an MS in Agriculture with a specialization in Food Science. Please refer to the MS Agriculture (p. 64) section in the College of Agriculture, Food and Environmental Sciences.

MS Nutrition

General Characteristics

The MS Nutrition program is designed to prepare graduates for advancement, specialization, and leadership in nutrition or healthcare careers. In addition, graduates will be prepared for further education in dietetic internships, professional schools, allied health professions, or doctoral studies in a number of academic areas including public health, animal science, or the social sciences.

The interdisciplinary Graduate Group in Nutrition (GGN) allows students to work with faculty from several departments and to choose a research topic from a broad range of themes including human nutrition, animal nutrition, kinesiology, public health, business, or social sciences.

Students select a suggested area of emphasis (Molecular Nutrition, Public Health Nutrition, or Health and Wellness) compatible with their interests and career goals. Students will complete coursework and a research-based thesis conducted under the supervision of a committee chair who must be a member of the GGN. A current list of GGN members and their research interests is available from the MS Nutrition Graduate Coordinator. In addition to the committee chair, the student's committee must have a minimum of two other qualified members. One of the three committee members must be a GGN member from the Food Science and Nutrition Department, the administrative home for the MS Nutrition program.

Admission Requirements

To qualify for admission to a Master's program, you must meet the Cal Poly university admission requirements for graduate standing, which are described in the Graduate Education (p. 408) section of the Cal Poly Catalog, as well as professional, personal, scholastic and other standards as prescribed by the program. The program specific requirements for admission to the MS Nutrition program must be submitted via the Cal Poly Graduate Education website and are as follows:

- Statement of purpose
- Transcript(s) from institution granting bachelor's degree
- Three letters of academic and/or professional recommendation
- Results from Graduate Record Examination (GRE standard test); quantitative, verbal and writing scores should be at the 50 percentile or higher for consideration
- All applicants who do not speak and write English as their primary language are required to complete the Test of English as a Foreign Language (TOEFL), taken within the last 2 years with a minimum score of 550 (paper version), 213 (computerized version), or 80 (internet based). Submit scores electronically to Institution Code: 4038. This requirement does not apply if country citizenship is listed on Cal Poly Admissions website: <https://admissions.calpoly.edu/applicants/international/checklist.html>.

Prerequisites

Applicants who lack the required preparatory coursework in basic sciences and nutrition must complete these courses prior to matriculation into the program. Basic science and nutrition courses include the following:

- Introductory chemistry series (one year), organic chemistry (min one course), biochemistry and an introductory biology course.
- FSN 328 Nutrient Metabolism I
- FSN 329 Nutrient Metabolism II

Program of Study

Each graduate student shall develop a Working Formal Study Plan with their thesis committee chair and members, prior to submitting the Final Formal Study Plan. Graduate students must file the Formal Study Plan for the degree with the MS Nutrition Graduate Coordinator no later than the end of the quarter in which the 12th unit of approved courses is completed. The Formal Study Plan must include at least 45 units of committee-approved graduate coursework (including degree-required plus elective coursework). At least 60% of the units required by the committee as reflected on the Formal Study Plan must be at the 500 level. A minimum GPA of 3.0 is required for coursework on the Formal Study Plan.

Blended BS Food Science + MS Agriculture, Specialization in Food Science

For motivated students, a blended program is available. The blended program allows students to simultaneously complete both a bachelor's degree in Food Science and a master's degree in Agriculture with a specialization in Food Science. The blended program offers promising individuals an opportunity to continue their studies in food science in a collaborative learning environment.

Eligibility for the Blended Program

Food Science majors wishing to pursue a MS Agriculture degree with a specialization in Food Science may apply in their junior year, after completing at least two upper division Food Science courses (FSN 330 and FSN 364). Students must apply before they have completed 180 units. A faculty committee chaired by the graduate program coordinator reviews all applications and selects individuals with records that demonstrate success at the undergraduate level as well as potential to succeed at the graduate level. Candidates shall meet the University requirements, as a minimum, stated in Blended BS+MS Programs (p. 412) in the Graduate Education section of the catalog. Contact the Food Science and Nutrition department for additional information.

BS Food Science

Program Learning Objectives

1. Graduates demonstrate critical thinking skills in addressing food science issues.
2. Graduates demonstrate the knowledge, ethics, and technical skills needed to succeed in food science fields and post-graduate studies.
3. Graduates demonstrate effective written and oral communication skills.
4. Graduates demonstrate the ability to work effectively as part of a problem-solving team.
5. Graduates demonstrate cultural competence with interacting diverse populations.

Program Educational Outcomes

- Food Science program graduates can integrate and apply principles of food chemistry, analysis, microbiology, processing and engineering to assure food quality and safety.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

FSN 101	Orientation to the Food Science and Nutrition Majors	1
FSN 125	Introduction to Food Science	4
FSN 204	Food Processing Operations	4
FSN 210	Nutrition	4
FSN 250	Food and Nutrition: Customs and Culture (USCP) (D4) ¹	4
FSN 311	Sensory Evaluation of Food	4
FSN 330	Introduction to Principles of Food Engineering	4
FSN 334	Food Packaging	3
FSN 335	Food Quality Assurance	4
FSN 364	Food Chemistry	4
FSN 368	Food Analysis	4
FSN 370	Food Plant Sanitation and Prerequisite Programs	4
FSN 374	Food Laws and Regulations	4
FSN 375	Food Safety	4
FSN 408	Food Product Development	4
FSN 461	Senior Project I	3
FSN 462	Senior Project II	3
Concentration courses (see below)		19-20

SUPPORT COURSES

AGB 214 or BUS 212	Agribusiness Financial Accounting Financial Accounting for Nonbusiness Majors	4
BIO 111	General Biology (B2 & B4) ¹	4
CHEM 127 & CHEM 128	General Chemistry for Agriculture and Life Science I and General Chemistry for Agriculture and Life Science II (B3 & B4) ¹	8
CHEM 312	Survey of Organic Chemistry	5
CHEM 313	Survey of Biochemistry and Biotechnology	5
MATH 118	Precalculus Algebra (B1) ¹	4
MCRO 221	Microbiology	4
MCRO 421	Food Microbiology	4
PHYS 121	College Physics I	4
STAT 218	Applied Statistics for the Life Sciences (B1) ¹	4

GENERAL EDUCATION (GE)

(See GE program requirements below.)	52
--------------------------------------	----

FREE ELECTIVES

Free Electives	0-1
Total units	180

¹ Required in Major or Support; also satisfies GE.

Concentrations

- Advanced Food Science (p. 111)
- Applied Food Technology (p. 112)
- Culinary (p. 112)

General Education (GE) Requirements

- 72 units required, 20 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics (no additional units required)	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E) (4 units in Major) ¹	0
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		52

¹ Required in Major or Support; also satisfies GE.

Advanced Food Science Concentration

FSN 444	Food Engineering	4
---------	------------------	---

FSN 474	Advanced Food Processing	4
MATH 161	Calculus for the Life Sciences I	4
MATH 162	Calculus for the Life Sciences II	4

Approved Electives

Select from the following:		4
AEPS 210	Viticultural Practices	
AEPS 250	California Fruit Growing	
AEPS 421	Postharvest Technology of Horticultural Crops	
AGB 212	Agricultural Economics	
ASCI 211	Meat Science	
ASCI 384	Processed Meat Products	
ASCI 415	HACCP for Meat and Poultry Operations	
BUS 207	Legal Responsibilities of Business	
BUS 384	Human Resources Management	
CHEM 129	General Chemistry for Agriculture and Life Science III	
CHEM 217	Organic Chemistry II	
CHEM 218	Organic Chemistry III	
DSCI 230	General Dairy Husbandry	
DSCI 231	General Dairy Manufacturing	
DSCI 401	Physical and Chemical Properties of Dairy Products	
DSCI 434	Cheese and Fermented Dairy Foods	
DSCI 435	Concentration and Fractionation Technology	
DSCI 444	Dairy Microbiology	
FSN 121	Fundamentals of Food	
FSN 201	Enterprise Project	
FSN 244	Cereal and Bakery Science	
FSN 304	Advanced Culinary Principles and Practice	
FSN 321	Contemporary Issues in Food Choice and Preparation	
FSN 341	Fermented Foods	
FSN 342	Brewing Science	
FSN 343	Institutional Foodservice I	
FSN 346	Brewing Methods	
FSN 401	Advanced Enterprise Project	
FSN 410	Nutritional Implications of Food Industry Practices	
FSN 426	Nutrition and Foodservice Systems Management	
ITP 330	Packaging Fundamentals	
ITP 341	Packaging Polymers and Processing	
MCRO 320	Emerging Infectious Diseases	
MCRO 342	Public Health Microbiology	
POLS 333	World Food Systems	
PSY 201	General Psychology	
or PSY 202	General Psychology	
One quarter of foreign language		
Total units		20

Applied Food Technology Concentration

FSN 341	Fermented Foods	4
or FSN 410	Nutritional Implications of Food Industry Practices	
FSN 444	Food Engineering	4
FSN 474	Advanced Food Processing	4
Approved electives		
Select from the following:		8
AEPS/WVIT 210	Viticultural Practices	
AEPS 250	California Fruit Growing	
AEPS 421	Postharvest Technology of Horticultural Crops	
AGB 212	Agricultural Economics	
AGB 301	Food and Fiber Marketing	
ASCI 211	Meat Science	
ASCI 384	Processed Meat Products	
ASCI 415	HACCP for Meat and Poultry Operations	
BUS 207	Legal Responsibilities of Business	
BUS 384	Human Resources Management	
CHEM 129	General Chemistry for Agriculture and Life Science III	
CHEM 217	Organic Chemistry II	
CHEM 218	Organic Chemistry III	
CHEM 324	Organic Chemistry Laboratory III	
DSCI 230	General Dairy Husbandry	
DSCI 231	General Dairy Manufacturing	
DSCI 401	Physical and Chemical Properties of Dairy Products	
DSCI 434	Cheese and Fermented Dairy Foods	
DSCI 435	Concentration and Fractionation Technology	
DSCI 444	Dairy Microbiology	
FSN 121	Fundamentals of Food	
FSN 201	Enterprise Project	
FSN 244	Cereal and Bakery Science	
FSN 304	Advanced Culinary Principles and Practice	
FSN 321	Contemporary Issues in Food Choice and Preparation	
FSN 342	Brewing Science	
FSN 343	Institutional Foodservice I	
FSN 344	Institutional Foodservice II	
FSN 346	Brewing Methods	
FSN 401	Advanced Enterprise Project	
FSN 426	Nutrition and Foodservice Systems Management	
ITP 330	Packaging Fundamentals	
ITP 341	Packaging Polymers and Processing	
MCRO 320	Emerging Infectious Diseases	
MCRO 342	Public Health Microbiology	
POLS 333	World Food Systems	

PSY 201	General Psychology	
or PSY 202	General Psychology	
One quarter of foreign language		
Total units		20

¹ FSN 341 may not be double-counted as an approved elective.

Culinary Concentration

FSN 121	Fundamentals of Food	4
FSN 304	Advanced Culinary Principles and Practice	4
FSN 321	Contemporary Issues in Food Choice and Preparation	4
FSN 343	Institutional Foodservice I	3
FSN 344	Institutional Foodservice II	4
Total units		19

BS Nutrition

Program Learning Objectives

1. Graduates demonstrate critical thinking skills in addressing nutrition issues.
2. Graduates demonstrate the knowledge, ethics, and technical skills needed to succeed in nutrition-related fields and post-graduate studies.
3. Graduates demonstrate effective written and oral communication skills.
4. Graduates demonstrate the ability to work effectively as part of a problem-solving team.
5. Graduates demonstrate cultural competence interacting with diverse populations.

Program Educational Outcomes

- Graduates can apply the knowledge of nutrients and foods to meet the nutritional and health needs of individuals and groups throughout the life cycle.
- Graduates can apply the principles of social, physical and biological sciences to address human nutrition issues.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

FSN 101	Orientation to the Food Science and Nutrition Majors	1
FSN 121	Fundamentals of Food	4

FSN 210	Nutrition	4
FSN 230	Elements of Food Processing	4
or FSN 319	Food Technology for the Consumer	
FSN 250	Food and Nutrition: Customs and Culture (USCP) (D4) ¹	4
FSN 310	Maternal and Child Nutrition	4
FSN 315	Nutrition in Aging	4
FSN 328 & FSN 329	Nutrient Metabolism I and Nutrient Metabolism II	8
FSN 415	Nutrition Education and Communications	4
FSN 420	Critical Evaluation of Nutrition Research	4
FSN 461	Senior Project I ⁴	3
MCRO 221	Microbiology (B2 & B4) ¹	4
or MCRO 224	General Microbiology I	
CHEM 127	General Chemistry for Agriculture and Life Science I (B3 & B4) ¹	4
CHEM 128	General Chemistry for Agriculture and Life Science II	4
CHEM 312 or CHEM 216	Survey of Organic Chemistry ² Organic Chemistry I	5
CHEM 313	Survey of Biochemistry and Biotechnology ²	5
or CHEM 371	Biochemical Principles	
ECON 201	Survey of Economics (D2) ¹	4
MATH 118	Precalculus Algebra (B1) ^{1,3}	4
STAT 218	Applied Statistics for the Life Sciences (B1) ¹	4
BIO 161	Introduction to Cell and Molecular Biology	4
Concentration courses (see concentrations below)		49-50
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		48
FREE ELECTIVES		
Free Electives		0-1
Total units		180

¹ Required in Major; also satisfies GE.

² Most Nutrition majors should take CHEM 312 and CHEM 313. Students choosing the Nutrition Science concentration may need to take CHEM 216 and CHEM 371, depending on their career goals and approved electives. Students selecting CHEM 216 must also take CHEM 217 and CHEM 218. See advisor.

³ MATH 116 and MATH 117 substitute.

⁴ Credit in FSN 470 with the topic "Senior Project: Nutrition for Sport and Exercise" (2 units) and credit in FSN 470 with the topic "Senior Project: Writing" (1 unit) may substitute for FSN 461.

Concentrations

- Applied Nutrition (p. 113)
- Nutrition and Food Industries (p. 114)
- Nutrition Science (p. 114)

General Education (GE) Requirements

- 72 units required, 24 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Major) ¹	0
B2	Life Science (4 units in Major) ¹	0
B3	Physical Science (4 units in Major) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy (4 units in Major) ¹	0
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E) (4 units in Major) ¹	0
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective ²	4
Total units		48

¹ Required in Major; also satisfies GE

² Requirement may be fulfilled if a student takes a GE course to fulfill a major requirement. If so, the student will need additional units of free electives to complete the total units required for the degree.

Applied Nutrition Concentration

FSN 321	Contemporary Issues in Food Choice and Preparation	4
FSN 343	Institutional Foodservice I	3
FSN 344	Institutional Foodservice II	4
FSN 416	Community Nutrition	4
FSN 417	Nutrition Counseling	4
FSN 426	Nutrition and Foodservice Systems Management	4
FSN 429	Clinical Nutrition I	4
FSN 430	Clinical Nutrition II	4
BIO 231	Human Anatomy and Physiology I	5
BIO 232	Human Anatomy and Physiology II	5

BIO 302	Human Genetics	4
or BIO 303	Survey of Genetics	
PSY 201	General Psychology	4
or PSY 202	General Psychology	
Total units		49

Nutrition and Food Industries Concentration

FSN 275	Elements of Food Safety	4
or FSN 375	Food Safety	
FSN 311	Sensory Evaluation of Food	4
FSN 335	Food Quality Assurance	4
FSN 364	Food Chemistry	4
FSN 368	Food Analysis	4
FSN 374	Food Laws and Regulations	4
FSN 408	Food Product Development	4
FSN 341	Fermented Foods ²	4
or FSN 410	Nutritional Implications of Food Industry Practices	

Approved electives ¹

Select from the following:		18
AEPS 250	California Fruit Growing	
AEPS 260	Introduction to Vegetable Science	
AEPS/BOT 329	Plants, Food, and Biotechnology	
AG/AEPS 315	Organic Crop Production	
AG/EDES/ENGR/ISLA/SCM/UNIV 350	The Global Environment	
AGC 407	Agricultural Publications	
AGED 404	Agricultural Leadership	
ASCI 211	Meat Science	
ASCI 384	Processed Meat Products	
ASCI 415	HACCP for Meat and Poultry Operations	
BIO/CHEM 308	Genetic Engineering Technology	
COMS 301	Business and Professional Communication	
DSCI 230	General Dairy Husbandry	
DSCI 231	General Dairy Manufacturing	
ENGL 310	Corporate Communication	
FSN 204	Food Processing Operations	
FSN 244	Cereal and Bakery Science	
FSN 304	Advanced Culinary Principles and Practice	
FSN 321	Contemporary Issues in Food Choice and Preparation	
FSN 330	Introduction to Principles of Food Engineering	
FSN 334	Food Packaging	
FSN 341	Fermented Foods	
FSN 343	Institutional Foodservice I	
FSN 344	Institutional Foodservice II	

FSN 370	Food Plant Sanitation and Prerequisite Programs	
FSN 426	Nutrition and Foodservice Systems Management	
FSN 444	Food Engineering	
FSN 463	Professional Practice in Nutrition and Dietetics	
FSN 474	Advanced Food Processing	
JOUR 203	News Reporting and Writing	
JOUR 205	Agricultural Communications	
JOUR 312	Public Relations	
JOUR 331	Contemporary Advertising	
JOUR 342	Public Relations Writing and Editing	
JOUR 407	Feature Writing	
MCRO 421	Food Microbiology	
MSCI 307	World Aquaculture: Applications, Methodologies and Trends	
PHYS 121	College Physics I	
PSY 201	General Psychology	
or PSY 202	General Psychology	
Total units		50

¹ Please consult the FSN advising materials and catalog for prerequisites.

² FSN 341 may not be double-counted as an approved elective.

Nutrition Science Concentration

FSN 416	Community Nutrition	4
FSN 429	Clinical Nutrition I	4
FSN 430	Clinical Nutrition II	4
BIO 231	Human Anatomy and Physiology I	5
BIO 232	Human Anatomy and Physiology II	5
BIO 302	Human Genetics	4-5
or BIO 303	Survey of Genetics	
or BIO 351	Principles of Genetics	
PHYS 121	College Physics I	4
Approved electives ¹		
Select from the following:		19-20
AEPS/BOT 329	Plants, Food, and Biotechnology	
ASCI 403	Applied Biotechnology in Animal Science	
ASCI 503	Advanced Molecular Techniques in Animal Science	
BIO 160	Diversity and History of Life	
BIO 162	Introduction to Organismal Form and Function	
BIO 253	Health Professions Shadowing	
BIO 305	Biology of Cancer	
BIO/CHEM 308	Genetic Engineering Technology	
BIO 405	Developmental Biology	
BIO 410	Functional Histology	
BIO 426	Immunology	
BIO 452	Cell Biology	

BIO 476	Gene Expression Laboratory
BUS 207	Legal Responsibilities of Business
BUS 212	Financial Accounting for Nonbusiness Majors
CHEM 129	General Chemistry for Agriculture and Life Science III
CHEM 217	Organic Chemistry II
CHEM 218	Organic Chemistry III
CHEM 231	Quantitative Analysis
CHEM 324	Organic Chemistry Laboratory III
CHEM 331	Quantitative Analysis
CHEM 372	Metabolism
CHEM 373	Molecular Biology
CHEM 377	Chemistry of Drugs and Poisons
CHEM 458	Instrumental Organic Qualitative Analysis
CHEM 474	Protein Techniques Laboratory
CHEM 475	Molecular Biology Laboratory
CHEM 477	Biochemical Pharmacology
COMS 418	Health Communication
ECON 303	Economics of Poverty, Discrimination and Immigration
FSN 417	Nutrition Counseling
FSN 463	Professional Practice in Nutrition and Dietetics
KINE 181	First Aid/CPR/AED
KINE 301	Functional Anatomy
KINE 303	Physiology of Exercise
KINE 304	Pathophysiology and Exercise
KINE 305	Drugs in Society
KINE 308	Motor Development
KINE 402	Motor Learning and Control
KINE 403	Biomechanics
KINE 406	Neuroanatomy
KINE 445	Electrocardiography
KINE 446	Echocardiography
MATH 161	Calculus for the Life Sciences I
or MATH 141	Calculus I
MATH 162	Calculus for the Life Sciences II
or MATH 142	Calculus II
MATH 143	Calculus III
MCRO 225	General Microbiology II
MCRO 320	Emerging Infectious Diseases
MCRO 342	Public Health Microbiology
MCRO 402	General Virology
MCRO 421	Food Microbiology
MCRO 423	Medical Microbiology
MCRO 433	Microbial Biotechnology
PHIL 339	Biomedical Ethics
PHYS 122	College Physics II
PHYS 123	College Physics III
PSY 201	General Psychology
or PSY 202	General Psychology

PSY 256	Developmental Psychology
PSY 310	Psychology of Death
PSY 317	Psychology of Stress
PSY 318	Psychology of Aging
PSY 330	Behavioral Effects of Psychoactive Drugs
PSY 340	Biopsychology
PSY 372	Multicultural Psychology
PSY 405	Abnormal Psychology
PSY 460	Child Abuse and Neglect
SCM 101	Introduction to Health Profession Careers
SCM 363	Public Health Fieldwork
SCM 451	Ethics in the Sciences
SOC 326	Sociology of the Life Cycle
One quarter of foreign language	

Total units 50

¹ Please consult the FSN advising materials and catalog for prerequisites.

Food Science Minor

Required Courses

FSN 125	Introduction to Food Science	4
or FSN 230	Elements of Food Processing	
FSN 204	Food Processing Operations	4
FSN 335	Food Quality Assurance	4

Emphasis area

Select from the following: 16

At least 10 units must be at the 300-400 level

ASCI 211	Meat Science
ASCI 384	Processed Meat Products
ASCI 415	HACCP for Meat and Poultry Operations
DSCI 231	General Dairy Manufacturing
FSN 244	Cereal and Bakery Science
FSN 275	Elements of Food Safety
FSN 311	Sensory Evaluation of Food
FSN 330	Introduction to Principles of Food Engineering
FSN 341	Fermented Foods
FSN 354	Packaging Function in Food Processing
FSN 368	Food Analysis
FSN 370	Food Plant Sanitation and Prerequisite Programs
FSN 374	Food Laws and Regulations
FSN 375	Food Safety
FSN 408	Food Product Development
FSN 410	Nutritional Implications of Food Industry Practices
FSN 444	Food Engineering
FSN 474	Advanced Food Processing

MCRO 421	Food Microbiology
Total units	28

Nutrition Minor

Required Courses

FSN 210	Nutrition	4
FSN 310	Maternal and Child Nutrition	4
FSN 315	Nutrition in Aging	4

Emphasis area

Select one area:	15-16
------------------	-------

Clinical: (CHEM 313 or equivalent as prerequisite)

FSN 328	Nutrient Metabolism I
FSN 329	Nutrient Metabolism II
FSN 429	Clinical Nutrition I
FSN 430	Clinical Nutrition II

Community: (CHEM 313 or equivalent as prerequisite)

FSN 328	Nutrient Metabolism I
FSN 329	Nutrient Metabolism II
FSN 416	Community Nutrition

Select one of the following:

ANT 401	Culture and Health
COMS 418	Health Communication
FSN 250	Food and Nutrition: Customs and Culture

FSN 415	Nutrition Education and Communications
POLS/UNIV 333	World Food Systems
RPTA 450	Resource and Grant Development
SOC 323	Social Stratification

Culinary Science and Food Service Management:

FSN 121	Fundamentals of Food
FSN 321	Contemporary Issues in Food Choice and Preparation
FSN 343	Institutional Foodservice I
FSN 304	Advanced Culinary Principles and Practice
or FSN 344	Institutional Foodservice II

Sports Nutrition: (CHEM 313 or equivalent as prerequisite)

FSN 328	Nutrient Metabolism I
FSN 329	Nutrient Metabolism II
KINE 303	Physiology of Exercise
KINE 451	Nutrition for Fitness and Sport

Total units	27-28
-------------	-------

MS Nutrition

Program Learning Objectives

After successfully completing the Master of Science in Nutrition, students will be able to:

1. Apply fundamental principles of nutrition science in research and required coursework

2. Explain, analyze, and interpret fundamental scientific concepts in the specific area of thesis research
3. Apply the scientific method to nutrition research through the design, conduct, and defense of a thesis research project
4. Apply critical thinking skills to the analysis of published research literature and the design/interpretation of a thesis research project
5. Show independent and creative thinking skills in the formulation, design, conduct, and interpretation of nutrition research
6. Demonstrate strong written and oral communication skills
7. Work productively, respectfully, and professionally as part of a research team and in other group settings
8. Exhibit leadership, ethical conduct, and community values

Required Courses

FSN 516	Population Health and Epidemiology	3
FSN 528	Biochemical and Molecular Aspects of Human Macronutrient Metabolism	4
FSN 529	Metabolic and Molecular Aspects of Vitamins	2
FSN 530	Metabolic and Molecular Aspects of Minerals	2
FSN 581	Graduate Seminar in Food Science and Nutrition	3
FSN 599	Thesis	6
STAT 511	Statistical Methods	4

Approved Electives

See approved electives list below.	21
Total units	45

Approved Electives

Select from one of the three Emphasis Areas in consultation with thesis supervisor (at least 3 units must be at the 500-level):

Molecular Nutrition Emphasis Area

Select from the following:

ASCI 403	Applied Biotechnology in Animal Science
ASCI 420	Animal Metabolism and Nutrition
ASCI 503	Advanced Molecular Techniques in Animal Science
BIO 441	Bioinformatics Applications
BIO 475	Molecular Biology Laboratory
BIO 476	Gene Expression Laboratory
BIO 501	Molecular & Cellular Biology
CHEM 474	Protein Techniques Laboratory
CHEM 528	Nutritional Biochemistry
FSN 420	Critical Evaluation of Nutrition Research
FSN 500	Individual Study
STAT 513	Applied Experimental Design and Regression Models
STAT 523	Design and Analysis of Experiments I

Public Health Nutrition Emphasis Area

Select from the following:

AGB 543	Agribusiness Policy and Program Analysis
AGB 554	Food System Marketing
FSN 420	Critical Evaluation of Nutrition Research
FSN 500	Individual Study
KINE 503	Current Health Issues
KINE 510	Advanced Health Behavior Change Programs
STAT 417	Survival Analysis Methods
STAT 419	Applied Multivariate Statistics
STAT 421	Survey Sampling and Methodology
STAT 513	Applied Experimental Design and Regression Models
STAT 524	Applied Regression Analysis
STAT 530	Statistical Computing with SAS

Health and Wellness Emphasis Area

Select from the following:

COMS 418	Health Communication
FSN 420	Critical Evaluation of Nutrition Research
FSN 500	Individual Study
KINE 408	Exercise and Health Gerontology
KINE 434	Health Promotion Program Planning
KINE 450	Worksite and University Health Promotion Programs
KINE 504	Advanced Pathophysiology and Exercise
KINE 522	Advanced Biomechanics
KINE 525	Advanced Motor Learning and Control
KINE 526	Advanced Sport and Exercise Psychology
KINE 530	Advanced Physiology of Exercise
PSY 465	Cross-Cultural International Psychology
STAT 513	Applied Experimental Design and Regression Models

Horticulture & Crop Science

Agricultural Sciences Bldg. (11), Room 230
Phone: 805.756.2279 or 805.756.1237; Fax: 805.756.6504
<http://aeps.calpoly.edu>

Department Head: Scott Steinmaus

Academic Programs

Program name	Program type
Agricultural and Environmental Plant Sciences	BS
Crop Science	Minor
Fruit Science	Minor
Landscape Horticulture	Minor
Plant Protection	Minor

The department offers the Agricultural and Environmental Plant Sciences major leading to the Bachelor of Science degree. Within this major are three concentrations: Environmental Horticultural Science, Fruit and Crop Science, and Plant Protection Science. Each concentration is well-grounded in the sciences and designed to prepare students for many attractive career opportunities.

Experiential Learning Opportunities and Facilities

The Horticulture and Crop Science Department has well-equipped laboratories for instruction in plant biotechnology, insect and weed pest management, postharvest technology, plant production, and landscape horticulture, including CAD capabilities and plant materials.

Students have hands-on experiences in the production and marketing of landscape and ornamental plants using comprehensive facilities at the 16-acre Environmental Horticulture Unit. This unit includes 35,000 square feet of greenhouses, a 5,000 square-foot retractable roof greenhouse, 7,500 square feet of shade houses, a 10,000-square foot U.S. Golf Association specified experimental green, an extensive field container growing area, and a five-acre arboretum. Additionally there are six horticulture laboratories, four of which are fitted with "smart-room" technologies for state-of-the-art teaching. The Leaning Pine Arboretum and Gardens is an outdoor teaching laboratory while the 200 acres of landscaped campus are planted with many interesting and unusual trees and shrubs from all over the world, as well as California natives.

The Crops Unit has 70 acres of productive citrus, avocados, grapes, deciduous fruit trees, and berries, with additional nonbearing acreage for instructional use. There are also approximately 35 acres of annual vegetable and forage crops, of which eleven acres are certified for organic production. There is a modern building containing two teaching labs with prep rooms, two greenhouses, coolers, hydroponic vegetable production facility and a state-of-the-art fruit and vegetable processing line.

The technological aspects of instruction are enhanced by an array of equipment required in crop and fruit production systems, postharvest handling, biotechnology, seed processing, pesticide application, nursery and greenhouse operation, parks and sport grounds maintenance and landscape construction. Field trips supplement instruction and are encouraged for many classes.

Students are encouraged to gain experience and earn income by participating in the Enterprise project program or by working on the Department's farmland. Enterprise projects are run under faculty

supervision but are student-operated. These projects provide students with a "no risk" glimpse of a commercial enterprise. The Department offers Enterprise projects in the production of vegetables, citrus, avocados, deciduous fruit and nut crops, floricultural crops, nursery plants, and forages. Available marketing outlets range from contract sales of vegetable seeds, wholesaling to area supermarkets, and direct marketing at local farmers' markets, garden centers, florist shops, and through campus outlets. Certified organic produce is marketed through weekly Farmers' Markets or it is sold to local restaurants and retailers.

The Department supports co-curricular activities for its students, including two student clubs: the Crops Club and the Horticulture Club. Student teams in flower judging, floral design and the landscape industry continue to win national championships.

Undergraduate Programs BS Agricultural and Environmental Plant Sciences

The Horticulture and Crop Science Department at Cal Poly offers students an opportunity not just to learn, but to learn-by-doing. Our students benefit from a broad spectrum of opportunities ranging from hands-on experiences in our fields, groves, nurseries, and greenhouses to real world application through internships and other collaborations with our industry partners. We also excel in providing a foundational plant science background and instilling a passion for plants, as we produce the next generation of leaders in the agricultural and environmental plant sciences.

Students in this major begin with core courses that provide a thorough introduction to the various concentrations. Each concentration, in turn, has required courses, which may be shared by other concentrations. In their first year, students explore curricular and professional opportunities to enable them to choose a concentration. In consultation with professional and faculty advisors, students have the flexibility to select electives within the concentrations according to their career goals and interests.

Internships are readily available to students and are highly recommended. Interns are typically placed with private industry and public facilities all across the United States but may also take place in foreign countries.

Over \$100,000 in scholarships are available to students as are several undergraduate student assistantships which are sponsored by industry.

Program alumni are employed nationally and internationally and are often leaders in their industries. Graduates of the department are in great demand. Typically there are more internship and job opportunities than there are students to fill them.

Concentrations

Each concentration offers introductory, intermediate and advanced classes. The concentrations offer their own course of study (including required courses and electives) as well as opportunities for cross-training and multi-disciplinary learning.

Environmental Horticultural Science

This concentration offers students a comprehensive preparation for positions in the nursery, turf, greenhouse, landscape, and floriculture industries, including public horticulture. Graduates are employed as business owners, growers, managers, researchers, educators, arboreta

and botanical garden directors, landscape contractors and designers, landscape management professionals, pest control advisors, and park, sports field and golf course superintendents. The curriculum stresses production and marketing of nursery plants, fresh flowers, and flowering and foliage plants, landscape contracting, design, installation and management, turf installation and management, integrated pest management, and horticultural education, native plant restoration, green roofs and walls, and the public display of plants.

Fruit and Crop Science

The Fruit and Crop Science concentration provides students with detailed knowledge of the production of tree fruits and nuts, grapes, small fruits, vegetables and other row crops, and forages. The concentration details factors influencing the growth, development, and productivity of these crops (e.g., site selection, cultivar selection, field and plant establishment, pest management, harvesting, and postharvest handling). The concentration also focuses on ongoing and newly emerging specialty industries and concerns such as beekeeping, postharvest technology, plant breeding and biotechnology, integrated pest management, and precision agriculture.

Plant Protection Science

Approximately one-third of the world's food crops are destroyed each year by insects, rodents, diseases and other pests. Finding ways to reduce these losses is the challenge of the plant protection specialist. In this concentration, students learn a broad range of pest management subjects including entomology, plant pathology, weed control and integrated pest management. Students develop an understanding of crop production principles, ecology, biotechnology, pesticide toxicology and environmental science. As environmental regulations continue to increase, employment opportunities will grow for those holding professional licenses, and this concentration prepares students to take the California Pest Control Advisor (PCA) and Certified Crop Advisor (CCA) license exams.

Crop Science Minor

Designed for students majoring in related academic disciplines who desire careers in crop production or its associated industries. The minor offers a broad-based knowledge of the science and technology of agronomy and vegetable production, especially as practiced in California. Not open to AEPS majors concentrating in Fruit and Crop Science or Plant Protection Science.

Fruit Science Minor

The minor is designed for students majoring in related academic disciplines who desire to seek careers in fruit production or its associated industries. The minor offers a broad-based knowledge of the science and technology of fruit and nut production. Not open to AEPS majors concentrating in Fruit and Crop Science or Plant Protection Science.

Landscape Horticulture Minor

The minor provides students with an understanding of the landscape horticultural industry and provides basic skills to understand the design, installation, and maintenance of landscapes. Students develop a knowledge of landscape plants and plant care as well as the basics of landscape contracting, including construction processes and materials used in the landscape industry. Students may learn advanced skills

and concepts in the areas of turfgrass for golf course/sports field applications, design/build, plant care and arboriculture. Not open to AEPS majors concentrating in Environmental Horticultural Science.

Plant Protection Minor

This program emphasizes both plant protection and plant production. Within the plant protection field of study, the student is exposed to a broad range of pest management subjects including entomology, plant pathology, and weed control. Within the production area the student may emphasize fruit production, crop production, ornamental horticulture, or natural resource management. Not open to AEPS majors.

Interdisciplinary Minors

The department participates in offering interdisciplinary minors in Geographic Information Systems for Agriculture, Land Rehabilitation, and Sustainable Agriculture. Please see College of Agriculture, Food and Environmental Sciences (p. 63) section for more information.

Graduate Programs

Cal Poly offers a Master of Science degree in Agriculture with specializations in Crop Science, Environmental Horticultural Science, and Plant Protection Science, among others. Please refer to the MS Agriculture (p. 64) section of the College of Agriculture, Food and Environmental Sciences.

BS Agricultural and Environmental Plant Sciences

Program Learning Objectives

1. Demonstrate technical competence in their concentration by identifying the majority of globally important food, and/or ornamental plants and demonstrating applications of theoretical sciences to their production, maintenance and post-harvest handling.
2. Effectively evaluate and adapt basic cultural practices, economic uses, and environmental interactions in the production of food, fiber, or ornamental plants.
3. Assess and implement appropriate sustainable growing and/or horticultural design practices based on region and microclimate, especially as they relate to water, soil and other natural resources.
4. Make informed and ethical decisions regarding environmental, social, and economic impacts of horticultural and agricultural activities and will contribute to their professions' continued relevancy by identifying, evaluating and responding to changing public perceptions, governmental regulations and industry challenges.
5. Practice a range of complex problem-solving exercises and excel in diagnosing and resolving plant health issues in outdoor and enclosed plant production systems.
6. Organize, synthesize, evaluate, and reconfigure information about complex, multivariate, living systems to gain new insights and communicate their findings to multiple stakeholder groups clearly, scientifically, and ethically.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation section of this catalog, including:

- 60 units upper division
- GWR
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

AEPS 101	Orientation to Horticulture and Crop Science	2
AEPS 120	Principles of Horticulture and Crop Science	4
AEPS 124	Plant Propagation	4
AEPS 304	Introduction to Plant Breeding	4
AEPS 313	Agricultural Entomology	4
AEPS 321	Weed Biology and Management	4
AEPS/BOT 323	Plant Pathology	4
AEPS 351	Experimental Techniques and Analysis	4
AEPS 410	Crop Physiology	4
AEPS 461	Senior Project I	2
AEPS 462	Senior Project II	2
BOT 121	General Botany (B2 & B4) ¹	4
SS 121	Introductory Soil Science	4
Concentration courses (see below)		42

SUPPORT COURSES

AGB 214	Agribusiness Financial Accounting	4
or BUS 212	Financial Accounting for Nonbusiness Majors	
BRAE 340	Irrigation Water Management (Area F) ¹	4
CHEM 127	General Chemistry for Agriculture and Life Science I (B3 & B4) ¹	4
CHEM 128	General Chemistry for Agriculture and Life Science II	4
CHEM 312	Survey of Organic Chemistry	5
MATH 118	Precalculus Algebra (B1) ¹	4
Select from the following:		4
SPAN 101	Elementary Spanish I	
SPAN 102	Elementary Spanish II	
SPAN 103	Elementary Spanish III	
SPAN 111	Elementary Hispanic Language and Culture (USCP)	
SS 221	Soil Health and Plant Nutrition	4
STAT 218	Applied Statistics for the Life Sciences (B1) ¹	4

GENERAL EDUCATION (GE)

(See GE program requirements below.) 52

FREE ELECTIVES

Free Electives	3
Total units	180

¹ Required in Major or Support; also satisfies GE.

Concentrations (select one)

- Environmental Horticultural Science (p. 120)
- Fruit and Crop Science (p. 121)
- Plant Protection Science (p. 122)

General Education (GE) Requirements

- 72 units required, 20 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A		Communication	
A1	Expository Writing		4
A2	Oral Communication		4
A3	Reasoning, Argumentation and Writing		4
Area B		Science and Mathematics (no additional units required)	
B1	Mathematics/Statistics (8 units in Support) ¹		0
B2	Life Science (4 units in Major) ¹		0
B3	Physical Science (4 units in Support) ¹		0
B4	One lab taken with either a B2 or B3 course		
Area C		Arts and Humanities	
C1	Literature		4
C2	Philosophy		4
C3	Fine/Performing Arts		4
C4	Upper-division elective		4
Area C elective		(Choose one course from C1-C5)	4
Area D/E		Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)		4
D2	Political Economy		4
D3	Comparative Social Institutions		4
D4	Self Development (CSU Area E)		4
D5	Upper-division elective		4
Area F		Technology	
F	Upper-division elective (4 units in Support) ¹		0
Total units			52

¹ Required in Major or Support; also satisfies GE.

Environmental Horticulture Science Concentration

AEPS 123	Landscape Installation and Maintenance	4
----------	--	---

AEPS 127	Horticulture and Landscape Design	4
AEPS 233	Plant Materials I	4
AEPS 234	Plant Materials II	4
AEPS 245	Horticultural Production Techniques	3
AEPS 350	Abiotic Plant Problems	3
AEPS 427	Disease and Pest Control Systems for Ornamental Plants	4

Approved electives¹

Select from the following (at least 8 units must be upper-division):

AEPS 126	Landscape Construction	
AEPS 212	Environmental Horticulture Enterprise Project I	
or AEPS 312	Environmental Horticulture Enterprise Project II	
AEPS 215	Floral Design I	
AEPS 225	Floral Design II	
AEPS 301	Principles of Landscape Design	
AEPS 327	Vertebrate Pest Management	
AEPS 332	Landscape Contracting	
AEPS 333	Greenhouse Vegetable Production	
AEPS 339	Internship in Horticulture and Crop Science ²	
AEPS 340	Principles of Greenhouse Environment	
AEPS 341	Cut Flower Production	
AEPS 342	Potted Plant Production	
AEPS 343	Turfgrass Management	
AEPS 381	Native Plants for California Landscapes	
AEPS 421	Postharvest Technology of Horticultural Crops	
AEPS 424	Nursery Crop Production	
AEPS 425	Arboriculture	
AEPS 432	Specialized Operations for Golf Courses and Athletic Fields	
AEPS 434	Landscape Management	
AEPS 435	Advanced Landscape Design	
AEPS 437	Park and Public Space Management	
AEPS 441	Biological Control for Pest Management	
BRAE 337	Landscape Irrigation	
BUS 346	Principles of Marketing	

Total units 42

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² A maximum of 4 units of AEPS 339 may count towards approved electives.

Fruit and Crop Science Concentration

AEPS 132	Pomology I	4
AEPS 133	Pomology II	4
AEPS 190	California Vegetable Production	4

AEPS 202	Fruit Enterprise Project	2
or AEPS 203	Organic Enterprise	
or AEPS 204	Vegetable Enterprise Project	
AEPS/BRAE 244	Precision Farming	4
AEPS 421	Postharvest Technology of Horticultural Crops	4

Approved electives (at least 11 units must be upper-division)¹

Select from the following: 20

AEPS 150	Forage Crops	
AEPS 175	Beekeeping	
AEPS 240	Commercial Seed Production	
AEPS/AG 315	Organic Crop Production	
AEPS 327	Vertebrate Pest Management	
AEPS 333	Greenhouse Vegetable Production	
AEPS 339	Internship in Horticulture and Crop Science ²	
AEPS 340	Principles of Greenhouse Environment	
AEPS 355	Citrus and Avocado Fruit Production	
AEPS 402	Fruit Enterprise Project Management	
or AEPS 403	Organic Enterprise Project Management	
or AEPS 404	Vegetable Enterprise Project Management	
AEPS 406	Advanced Weed Management	
AEPS/WVIT 414	Grape Pest Management	
AEPS 423	Advanced Vegetable Science	
AEPS 427	Disease and Pest Control Systems for Ornamental Plants	
AEPS 431	Insect Pest Management	
AEPS 441	Biological Control for Pest Management	
AEPS 445	Cropping Systems	
AG/ASCI 360	Holistic Management	
BRAE 405	Chemigation	
BRAE 438	Drip/Micro Irrigation	
BRAE 440	Agricultural Irrigation Systems	
FSN 275	Elements of Food Safety	
SS 321	Soil Morphology	
SS 322	Soil Plant Relationships	
WVIT 233	Basic Viticulture	
WVIT/AEPS 331	Advanced Viticulture - Fall	
WVIT 332	Advanced Viticulture - Winter	
WVIT 333	Advanced Viticulture - Spring	

Total units 42

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² A maximum of 4 units of AEPS 339 may count towards approved electives.

Plant Protection Science Concentration

AEPS 202	Fruit Enterprise Project	2
or AEPS 204	Vegetable Enterprise Project	
or AEPS 212	Environmental Horticulture Enterprise Project I	
or AEPS 312	Environmental Horticulture Enterprise Project II	
or AEPS 402	Fruit Enterprise Project Management	
or AEPS 403	Organic Enterprise Project Management	
or AEPS 404	Vegetable Enterprise Project Management	
AEPS 327	Vertebrate Pest Management	4
AEPS 406	Advanced Weed Management	4
AEPS 427	Disease and Pest Control Systems for Ornamental Plants	4
AEPS 431	Insect Pest Management	4
AEPS 441	Biological Control for Pest Management	4
Approved electives¹		
Select from the following:		20
AEPS 132	Pomology I	
AEPS 133	Pomology II	
AEPS 150	Forage Crops	
AEPS 175	Beekeeping	
AEPS 190	California Vegetable Production	
AEPS 240	Commercial Seed Production	
AEPS/BRAE 244	Precision Farming	
AEPS 245	Horticultural Production Techniques	
AEPS 333	Greenhouse Vegetable Production	
AEPS 339	Internship in Horticulture and Crop Science ²	
AEPS 340	Principles of Greenhouse Environment	
AEPS 341	Cut Flower Production	
AEPS 342	Potted Plant Production	
AEPS 343	Turfgrass Management	
AEPS 355	Citrus and Avocado Fruit Production	
AEPS 421	Postharvest Technology of Horticultural Crops	
AEPS 445	Cropping Systems	
CHEM 313	Survey of Biochemistry and Biotechnology	
FSN 275	Elements of Food Safety	
MCRO 221	Microbiology	
WVIT 233	Basic Viticulture	
WVIT/AEPS 331	Advanced Viticulture - Fall	
WVIT 332	Advanced Viticulture - Winter	
WVIT 333	Advanced Viticulture - Spring	
Total units		42

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² A maximum of 4 units of AEPS 339 may count towards approved electives.

Crop Science Minor

Required Courses

AEPS 120	Principles of Horticulture and Crop Science	4
AEPS 190	California Vegetable Production	4
AEPS 203	Organic Enterprise	2
or AEPS 204	Vegetable Enterprise Project	
AEPS/BRAE 244	Precision Farming	4
BRAE 340	Irrigation Water Management	4

Approved Electives

Select from the following:		12
AEPS 304	Introduction to Plant Breeding	
AEPS 313	Agricultural Entomology	
AEPS/AG 315	Organic Crop Production	
AEPS 321	Weed Biology and Management	
AEPS 333	Greenhouse Vegetable Production	
AEPS 421	Postharvest Technology of Horticultural Crops	
AEPS 445	Cropping Systems	

Total units 30

Fruit Science Minor

Required Courses

AEPS 120	Principles of Horticulture and Crop Science	4
AEPS 132	Pomology I	4
or AEPS 250	California Fruit Growing	
AEPS 133	Pomology II	4
or WVIT 233	Basic Viticulture	
AEPS 202	Fruit Enterprise Project	2
AEPS 355	Citrus and Avocado Fruit Production	4

Approved Electives

Select from the following:		12
AEPS 313	Agricultural Entomology	
AEPS 321	Weed Biology and Management	
AEPS 327	Vertebrate Pest Management	
AEPS/BOT 329	Plants, Food, and Biotechnology	
AEPS 421	Postharvest Technology of Horticultural Crops	
AEPS 445	Cropping Systems	
BRAE 340	Irrigation Water Management	
WVIT/AEPS 331	Advanced Viticulture - Fall	
or WVIT 332	Advanced Viticulture - Winter	
or WVIT 333	Advanced Viticulture - Spring	

Total units 30

Landscape Horticulture Minor

Required Courses

AEPS 120	Principles of Horticulture and Crop Science	4
AEPS 123	Landscape Installation and Maintenance	4
AEPS 126	Landscape Construction	3
AEPS 233 or AEPS 234	Plant Materials I Plant Materials II	4
AEPS 332	Landscape Contracting	4
Approved Electives		
Select from the following:		11
AEPS 343	Turfgrass Management	
AEPS 381	Native Plants for California Landscapes	
AEPS 425	Arboriculture	
AEPS 432	Specialized Operations for Golf Courses and Athletic Fields	
AEPS 434	Landscape Management	
AEPS 437	Park and Public Space Management	
Total units		30

Plant Protection Minor

Required Courses

AEPS 120	Principles of Horticulture and Crop Science	4
AEPS 313	Agricultural Entomology	4
AEPS 321	Weed Biology and Management	4
AEPS/BOT 323	Plant Pathology	4

Elective Courses

Agricultural Production

Select from the following: ¹		4
AEPS 124	Plant Propagation	
AEPS 132	Pomology I	
AEPS 150	Forage Crops	
AEPS 190	California Vegetable Production	
AEPS 230	Environmental Horticulture	
AEPS 240	Commercial Seed Production	
AEPS 245	Horticultural Production Techniques	
AEPS 250	California Fruit Growing	
AEPS 260	Introduction to Vegetable Science	
AEPS 341	Cut Flower Production	
AEPS 355	Citrus and Avocado Fruit Production	
AEPS 445	Cropping Systems	
NR 141	Introduction to Forest Ecosystem Management	
NR 260	Forest Practices and Environmental Protection	
NR 350	Urban Forestry	
WVIT 233	Basic Viticulture	

Enterprise Project

Select from the following: ¹		2
AEPS 202	Fruit Enterprise Project	
AEPS 203	Organic Enterprise	
AEPS 204	Vegetable Enterprise Project	

AEPS/WVIT 210	Viticultural Practices	
AEPS 312	Environmental Horticulture Enterprise Project II	
Pest Management		
Select from the following: ¹		8
AEPS 327	Vertebrate Pest Management	
AEPS 406	Advanced Weed Management	
AEPS/WVIT 414	Grape Pest Management	
AEPS 427	Disease and Pest Control Systems for Ornamental Plants	
AEPS 431	Insect Pest Management	
AEPS 441	Biological Control for Pest Management	
Total units		30

¹ Approval of minor advisor required.

Military Science

Dexter Bldg. (34), Room 115
Phone: 805.756.7682
<https://armyrotc.calpoly.edu>

Department Head: Major Joshua Gillen

Programs

Program name	Program type
ROTC	Four-Year Program
Military Science	Minor

Four-Year Program

The Military Science Department conducts a dynamic four-year program of instruction which develops the mental and physical qualifications of graduates in preparation for positions of leadership within the military and civilian communities. Students may enroll at any time for full academic elective credit without incurring any military service obligation. However, the last two years of the program are oriented toward preparing the student for a military career.

The innovative and well-taught courses complement all major areas of study by broadening the student's basic education. The complete curriculum includes both military leadership and management courses; courses which provide an awareness of the heritage of the U.S. military; the Armed Forces' role in national defense strategy; professional military subjects; and military ethics.

Students desiring to attain a highly sought-after commission as a Second Lieutenant in the U.S. Army must meet eligibility requirements and complete the entire Military Science/ROTC (Reserve Officers' Training Corps) Advanced Course (25 units). To be eligible for participation in the Cal Poly ROTC Program, a student must be enrolled full time (12 units) at Cal Poly, have at least two years remaining as a university student to permit completion of the advanced course prior to reaching the 30th birthday, and be physically qualified.

Financial Assistance

Many opportunities for financial assistance are available to students. Three areas of opportunities are: ROTC cadets who sign a contract for Advanced Phase, students who earn an ROTC scholarship, and cadets who train with Reserve or National Guard units. All ROTC cadets sign a contract to participate in the Advanced Phase of ROTC and receive a \$300 - \$500 a month allowance. Criteria to participate in the Advanced Phase are stated later. Highly competitive two-, two and a half, three-, and four-year ROTC scholarships are available. The scholarship provides payment of either full tuition or room and board (student's choice), books, supplies, and the \$300 - 500 a month allowance for the duration of the scholarship. Students interested in ROTC scholarship should contact the Military Science Department. Reserve or National Guard training provides an additional two sources of financial assistance: approximately \$165 a month for one weekend drill and approximately \$190 a month tuition assistance from the National Guard/Army Reserve "New GI Bill" benefits.

Equipment and Uniforms

All necessary equipment, uniforms and textbooks for participation in the Military Science/ROTC program are furnished to the student by the United States Government free of charge. Title to this property, other than expendable items, remains with the government.

Phases of Four-Year Program

The four-year program elective military science curriculum is divided into two diverse phases. The basic phase is primarily for freshmen and sophomores, and the advanced phase is for junior and senior level students.

Basic Phase

The Basic Phase is a two-year challenging opportunity where students may, without obligation, investigate the ROTC Program and the military as a full- or part-time career. Students may enter and leave this phase during any quarter. The curriculum for the basic phase is listed below and offers many exciting opportunities for all students. To become an ROTC cadet during this phase requires the student be registered for a Military Science class, completion of an ROTC enrollment form (obtained at the Military Science Department, Dexter Building, Room 115), and an interview with the ROTC Enrollment Officer. Because this phase is for students to examine the ROTC Program without obligation, participation in ROTC activities is encouraged but not mandatory.

Entry to the challenging Advanced Phase is accomplished either by successfully completing the Basic Phase classes, completing ROTC Leader's Training Course or completing any military basic training program. Students have the option of contracting any time during their second year of the Basic Phase of study.

ROTC Leader's Training Course (Summer Session only)

One method to qualify for the Advanced Phase is to successfully complete the four-week challenging ROTC Leader's Training Course (LTC). Students normally attend LTC during the summer between their second and third academic years. Transfer students may complete the camp during the summer immediately prior to their matriculation at Cal Poly. It is important that potential transfer students who plan to participate in the two-year ROTC program make their intentions known directly to the Military Science Department no later than June 1 of the year they plan to register at the university even though this date may precede the date of their final acceptance by the university.

The government provides a transportation allowance to and from LTC and pay at the rate of one-half of a Second Lieutenant's basic pay. All equipment, uniforms, room, board and medical care are furnished free while at camp. A maximum of 7 units elective credit may be earned for attending LTC. No military obligation is incurred for attending this camp.

Basic Training

Outstanding students who have successfully served on active duty, regardless of the branch of service, are qualified to enter the Advanced Phase because they have completed basic training for their particular branch of service. Also, students who have been or are members of Reserve or National Guard units and have completed basic training are qualified for the Advanced Phase.

Advanced Phase

The Advanced Phase is a two-year period where ROTC cadets receive advanced leadership and management training. The cadets receive many hours of hands-on, practical leadership experiences to prepare them for a military career or a management position in the civilian sector. To become a cadet in the Advanced Phase a student must complete the Basic Phase, ROTC Summer Leader's Training Course (LTC) or Basic Training. The student must also make a commitment to attend all required training activities and sign a contract to accept a prestigious

commission in the United States Army. In return for the student's commitment, the Military Science Department provides \$450-500 a month (which is based on program year), classroom instruction, real leadership opportunities, and continuous professional development of their leadership skills.

After their first year of the Advanced Phase, cadets usually attend a four-week camp where their leadership skills are further developed and assessed. All equipment, uniforms, room, board, and medical care are furnished free while at this camp. The cadets also receive approximately \$800 during the five weeks. Upon successful completion of the Advanced Phase and graduation from the university, the cadet is commissioned as a Second Lieutenant in the United States Army.

Simultaneous Membership Program

Students can serve simultaneously in either the California National Guard or Army Reserve while they are cadets in ROTC and receive pay from both their unit and ROTC. Those who complete the ROTC Advanced Phase prior to graduation may continue serving in the Reserve or National Guard in the Simultaneous Membership Program. Since students can earn as much as \$4,000 each year, this program provides both substantial financial benefits and leadership experience.

Military Science Minor

The minor emphasizes the following personal and technical skills: time, personnel, and resource management under duress; knowledge of U.S. military heritage, customs, and courtesies; planning and briefing under time constraints; current national defense issues; equal opportunity, sexual harassment, and military ethics; military justice; physical fitness; map reading and orienteering; leadership, management, and counseling skills under duress; oral, visual, and written communication skills in accordance with Army norms; small unit tactics. It provides marketable skills to students interested in government service, personnel management, and law enforcement. The Military Science Minor is limited to contracted ROTC cadets only. A minimum GPA of 2.5 is required in all units counted for completion of the minor.

Basic Phase

Freshman

MSL 101	Foundation of Officership I	1
MSL 102	Foundation of Officership II	1
MSL 103	Basic Leadership	1
MSL 110	Exercises in Military Leadership	1
MSL 111	Orienteering	2
MSL 112	The Army Physical Fitness Program	1

Sophomore

MSL 201	Foundations of Leadership I	2
MSL 202	Foundations of Leadership II	2
MSL 203	Foundations of Leadership III	2
MSL 212	Leader's Training Course ¹	1-7
MSL 229	Ranger Challenge	2
MSL 240	American Military History and the Evolution of Western Warfare ²	4

Total units 20-26

¹ LTC is an optional 5-week summer training course (1-7 units) at Fort Knox, Kentucky.

² MSL 240 or equivalent is required for commissioning of all cadets; approved substitutions are HIST 320, HIST 321 and HIST 322.

Advanced Phase

Junior

MSL 301	Tactical Leadership I	3
MSL 302	Tactical Leadership II	3
MSL 303	Applied Leadership	3
MSL 310	Advanced Leadership of Military Exercises	1
MSL 312	Leadership of the Army Physical Fitness Program	1
MSL 314	Leadership Development and Assessment Course ¹	6

Senior

MSL 400	Special Problems for Advanced Undergraduates	2
MSL 401	Developmental Leadership I	3
MSL 402	Developmental Leadership II	3
MSL 403	Adaptive Leadership	3
MSL 410	Administration and Evaluation of Exercises in Military Leadership	1
MSL 412	Administration and Evaluation of the Army Physical Fitness Program	1
MSL 470	Selected Advanced Topics	1-4

Total units 31-34

¹ LDAC is a required 5-week summer training experience at Fort Lewis, Washington (6 credits).

Military Science Minor

Required Courses

Select from the following:		4
MSL 240	American Military History and the Evolution of Western Warfare	
HIST 320	Colonial and Revolutionary America	
HIST 321	Civil War America	
HIST 322	Modern America	
MSL 301	Tactical Leadership I	3
MSL 302	Tactical Leadership II	3
MSL 303	Applied Leadership	3
MSL 401	Developmental Leadership I	3
MSL 402	Developmental Leadership II	3
MSL 403	Adaptive Leadership	3

Approved Electives

Select from the following:	6
MSL 101	Foundation of Officership I
MSL 102	Foundation of Officership II
MSL 103	Basic Leadership
MSL 110	Exercises in Military Leadership
MSL 111	Orienteering
MSL 112	The Army Physical Fitness Program
MSL 201	Foundations of Leadership I

MSL 202	Foundations of Leadership II
MSL 212	Leader's Training Course
MSL 229	Ranger Challenge
MSL 310	Advanced Leadership of Military Exercises
MSL 312	Leadership of the Army Physical Fitness Program
MSL 314	Leadership Development and Assessment Course (ROTC Only)
MSL 410	Administration and Evaluation of Exercises in Military Leadership
MSL 412	Administration and Evaluation of the Army Physical Fitness Program
MSL/RPTA 275	Facilitation and Teambuilding
Total units	28

Natural Resources Management and Environmental Sciences

Baker Center for Sciences and Mathematics Bldg. (180), Room 209
Phone: 805.756.2702; Fax: 805.756.1402
<http://nres.calpoly.edu>

Department Head: Greg Brown

Academic Programs

Program name	Program type
Environmental Earth and Soil Sciences	BS
Environmental Management and Protection	BS
Environmental Soil Science	Minor
Forestry and Natural Resources	BS
Forestry Sciences	MS
Indigenous Studies in Natural Resources and the Environment	Minor

The Natural Resources Management and Environmental Sciences department offers three undergraduate majors – Environmental Earth and Soil Sciences, Environmental Management and Projection, and Forestry and Natural Resources. Students have access to several thousand acres of agricultural, forest, and rangeland managed by the college. Students gain hands-on experience with equipment and techniques in common use by foresters, natural resources managers, soil scientists, agricultural scientists, geologists, and environmental scientists. The department is equipped for analysis of soil, plant, tree, rock, and water samples. Analytical methods available to students include inductively coupled plasma – atomic emission spectroscopy (ICP-AES), flame atomic absorption spectrometry (FL-AAS), high temperature combustion analysis of carbon, nitrogen, and sulfur, petrographic microscopy with digital image analysis, as well as a suite of geographic and geospatial analytical techniques and instrumentation.

The department maintains greenhouse research space with an outdoor erosion research facility, providing opportunities for students to assess erosion control practices used to protect and improve water quality. Additionally, the department operates state-of-the-art weather monitoring equipment on Cal Poly rangelands, providing data for a wide variety of interdisciplinary research projects.

Experiential Learning

The Natural Resources Management and Environmental Sciences Department has a number of outdoor field sites where faculty and student learn-by-doing projects and research are conducted. Facilities sited at the Cal Poly campus include a Forestry Skills Center, computer labs, GIS laboratories, Coastal Resources Institute Research field lab, and several well-equipped greenhouses. Most importantly, the department plays a lead role in administering the Swanton Pacific Ranch and School Forest near Santa Cruz, California. This 3800-acre ranch includes redwood forests, salmonid-bearing streams, agricultural land, and many other ecosystems. The Swanton Pacific Ranch provides hands-on learning of active forest, ranch, agricultural, and watershed management activities. The management of these forest resources is internationally certified by the Forest Stewardship Council. Students make extensive use of these facilities. Significant field work and laboratory activities occur in all undergraduate and graduate programs requiring field clothing and associated safety equipment.

In addition to these campus-based learning experiences, the department places great importance on work experience before graduation. Work experience validates the student's career goals, confirms the relevance of their classroom education, while offering a pathway to employment. Students can earn course credit through internship, supervisory courses, and/or for volunteer or paid work positions related to their major.

Students are encouraged to reinforce their education, develop professional contacts, and strengthen their career potential by participating in any of the following activities: the Environmental Sciences Club; the Soil Judging Team; Association of Environmental Professionals Student Chapter (AEP); Society of American Foresters Student Chapter (SAF); Logging Team; Student Association of Fire Ecology; and/or Xi Sigma Pi Forestry Honorary Society; attending international and national conferences; and internships and cooperative education programs with government and industry. Each of these opportunities, combined with a friendly, helpful atmosphere, provide students a college experience that is highly personal as well as rewarding. Students also are encouraged to investigate opportunities for international education. Please see the Cal Poly International Program (p. 419) program section of this catalog. Significant field work and laboratory activities occur in all undergraduate and graduate programs requiring field clothing and associated safety equipment.

Undergraduate Programs

BS Environmental Earth and Soil Sciences

The BS in Environmental Earth and Soil Sciences provides a strong foundation for understanding and improving the utilization of land, water, and atmospheric resources. The program emphasizes a wide range of disciplines in natural resources and in the cultures that use and modify them. The core of the Environmental Earth and Soil Sciences curriculum is composed of geology, soil science, geography, and basic science courses and is strengthened by a diverse array of related topical and technical specialties, which include: climate change studies, environmental mitigation strategies, environmental policy and management, forest and environmental practices, geospatial technology, hydrology, soil geotechnical studies, sustainable agriculture, and urban forestry.

The Environmental Earth and Soil Sciences major provides detailed and thorough training in the natural and cultural processes that govern the relationship between humans and their habitats. The program also furnishes students with the marketable expertise to assess, manage, repair, and improve this fragile relationship while acquiring a well-rounded education in the natural sciences. In addition, majors can meet the educational requirements for professional certification in a number of areas (e.g. erosion and sediment control, hydrology, soil conservation, soil science) and find their training ideal for graduate school preparation in a number of related disciplines.

Due to the multidisciplinary nature of the Environmental Earth and Soil Sciences major, students have access to diverse faculty and laboratories in several colleges on campus. California's Central Coast offers a diverse environmental and cultural setting for real-world training and experiences in earth sciences.

Undergraduate students majoring in Environmental Earth and Soil Sciences earn the credentials for useful careers in resource assessment and administration. They graduate with a substantial and well rounded education in the natural sciences. Moreover, Environmental Earth and Soil Sciences graduates possess the understanding, flexibility, and

tools to appreciate and adapt to a changing world and its employment opportunities.

In addition to the required major courses, students select courses from an expansive list of approved electives, or take a minor, or select one of the following concentrations.

Concentrations

Geology

Students learn the fundamentals of a broad variety of geologic subdisciplines, including mineralogy, petrology, seismology, stratigraphy, geochemistry, geomorphology and structural geology. Each of these fundamental subdisciplines are supported by curriculum that emphasizes methods of data collection, interpretation and professional communication of results. Upon completion of this concentration, students are able to critically evaluate geologic reports within the context of our evolving societal needs, and are prepared to pursue post graduate degrees in the geosciences and/or careers in the geotechnical industry.

Hydrology

Students learn the fundamentals of a broad variety of hydrologic subdisciplines including vadose zone hydrology, groundwater hydrology, soil erosion control, water quality, and watershed management. Each of these fundamental subdisciplines are supported by curriculum that emphasizes methods of data collection and interpretation, and professional communication of results. Upon completion of this concentration, students will be qualified to work in a water-related position for Federal and State agencies, private companies, and environmental consulting firms. Completion of the Hydrology Concentration meets the course requirements of the U.S. Office of Personnel Management (OPM) for employment as a Hydrologist (GS 1315)

BS Environmental Management and Protection

The BS in Environmental Management and Protection is an interdisciplinary course of study integrating the biophysical and social/economical/political sciences in natural resource management. The curriculum emphasizes management and protection of ecosystem structures and processes that sustain uses of environmental resources. The major provides students with the science and management background that, when properly integrated, can guide consumptive uses of resources in a sustainable manner for current and future generations.

Since environmental problems arise from human demands and stresses on the environment, solutions must focus on the human dimension of ecosystems. Thus, environmental management is the management of both people and resources to attain human goals while protecting environmental values in order to sustain natural systems.

Graduates are prepared for a broad range of professional careers in environmental assessment, impact analysis, project management, and impact mitigation monitoring.

Knowledge of the legal and regulatory environment is balanced with study of ecological and economic theories and practices to solving social conflicts over environmental uses and impacts.

The Environmental Management and Protection major is endorsed and supported by the California Association of Environmental Professionals

(AEP), a professional association representing the full range of environmental professions in both private and public sectors.

In addition to the required major courses, students select courses from an expansive list of approved electives, or take a minor, or select one of the following concentrations.

Concentrations

Watershed Management and Hydrology

This concentration provides students a focused and encompassing program in watershed management, including a proficiency in watershed hydrology in forest ecosystems, Mediterranean ecosystems, rangeland hydrology, post-fire watershed evaluation, watershed and stream restoration, and urban/wildland hydrologic implications. Students pursuing this concentration can qualify as hydrologists under U.S. Government OPM guidelines (GS 1315).

Wildlife Biology Concentration

This specialized course of study prepares students for wildlife biology certification and employment in the fish and wildlife areas of law enforcement, management, and production.

BS Forestry and Natural Resources

The BS in Forestry and Natural Resources prepares students for careers in the protection and management of our forest and natural resources. Students may specialize in watershed management and hydrology, wildlife fire and fuels management, or wildlife biology. Optionally, students may select courses from approved electives that are categorized by career area.

Graduates qualify for such positions as: forester, environmental planner and assessor, natural resource manager, urban forester, park administrator, watershed manager, hydrologist, fire and fuels manager, and many other related environmental career areas. Cal Poly graduates are employed throughout the world: establishing, managing and sustaining forests and urban wildland areas; providing opportunities for a full range of uses; teaching; extension; research; and protecting and managing the environment.

Students can complete an internship equivalent to half-time work. Paid internships are available at Swanton Pacific Ranch, or the student may choose to pursue a seasonal job, volunteer work, or a cooperative education program. Work experience for academic credit must be documented by a work supervisor and approved by the student's academic advisor.

Students are required to purchase 8-inch+ high field boots, hard-hats (OSHA approved), hand calculator capable of linear regression, 10X hand lens, and an engineers scale ruler prior to taking 200- or 300-level major courses. Students are strongly encouraged to purchase a laptop before beginning 300-level major courses.

The Society of American Foresters accredits the Forestry and Natural Resources program. Also, the U.S. Office of Personnel Management (OPM) recognizes employment as a forester with the Federal Government upon graduation.

In addition to the required major courses, students select courses from an expansive list of approved electives, or take a minor, or select one of the following concentrations.

Concentrations

Watershed Management and Hydrology

This concentration provides students a focused and encompassing program in watershed management, including a proficiency in watershed hydrology in forest ecosystems, Mediterranean ecosystems, rangeland hydrology, post-fire watershed evaluation, watershed and stream restoration, and urban/wildland hydrologic implications. Students pursuing this concentration can qualify as hydrologists under U.S. Government OPM guidelines (GS 1315).

Wildlife Biology Concentration

This specialized course of study prepares students for wildlife biology certification and employment in the fish and wildlife areas of law enforcement, management, and production.

Wildland Fire and Fuels Management

Focused study on the management of fire and fuels on landscapes ranging from the wildlands to the urban interface. Emphasis on the technologies, issues and policies in managing fire, using fire as an ecosystem management tool and social and economic impacts of fire.

Environmental Soil Science Minor

Natural Resources Management & Environmental Sciences Department
Bldg. 180, Room 515
Phone: 805.756.1691
Email: cappel@calpoly.edu

Coordinator: Dr. Chip Appel

Students completing the minor gain skills in understanding and assessing the science and management of soils. Because soils are necessary for sustaining all living organisms, this minor is relevant to all students. Students will gain practical, meaningful, and hands-on experiences in both environmental and agricultural applications of the world's finite soil resources. This minor allows students the opportunity to relate their interests to the ecology, classification, mineralogy, chemistry, physics, and fertility/health parameters of soils.

Minor Requirements (p. 142)

Indigenous Studies in Natural Resources and the Environment Minor

Natural Resources Management & Environmental Resources Department
Bldg. 11, Room 217
Phone: 805.756.2702

Coordinators:

Priya Verma, Natural Resources Management and Environmental Sciences
805.756.2773; pverma@calpoly.edu

Kate Martin, Ethnic Studies
805.756.2827; kmartin@calpoly.edu

This interdisciplinary minor is sponsored by the Natural Resources Management and Environmental Sciences department in the College of Agriculture, Food and Environmental Sciences and the Ethnic Studies department in the College of Liberal Arts. The minor consists of innovative coursework and provides research opportunities that incorporate indigenous ecological knowledge in areas such as conservation biology, environmental biology, wildlife and fisheries sciences, forest resources management, environmental studies and

environmental sciences: as well as agriculture, ethnic studies, geography, biology, and recreation, parks and tourism.

The Indigenous Studies in Natural Resources Management and the Environment minor aims to bring together principles of both Indigenous knowledge and Western science. Instruction in these two approaches will provide students with the necessary skills, practical research methods and critical thinking abilities for addressing complex environmental and health issues, and resource management problems facing both Indigenous and non-Indigenous communities around the world. Contact the minor coordinator for more details.

Water Science

An interdisciplinary minor sponsored by the departments of BioResource and Agricultural Engineering, and Natural Resources Management and Environmental Sciences, that emphasizes one of three areas of study: irrigation, water policy, or watershed management. For more information, see the College of Agriculture, Food and Environmental Sciences (p. 63) section.

The department also participates in offering minors in Land Rehabilitation and Restoration Ecology, Rangeland Resources, Anthropology-Geography, and Geology. Please see College of Agriculture, Food and Environmental Sciences (p. 63), College of Liberal Arts (p. 257) or the Physics (p. 382) page for additional information.

Additional Minors

Geographic Information Systems for Agriculture

An interdisciplinary minor sponsored by the departments of BioResource and Agricultural Engineering, Natural Resources Management and Environmental Sciences, and Horticulture and Crop Science. For more information, see the College of Agriculture, Food and Environmental Sciences (p. 63) section.

Graduate Program MS Forestry Sciences

The Master of Science degree program in Forestry Sciences offers advanced study in a range of forest science sub-disciplines or in preparation for study leading to the Ph.D. degree.

Areas of Emphasis

Students may select one of the following emphasis areas that incorporate specific scientific and professional disciplines:

Forest Resource Sciences

Offers advanced preparation in the forestry disciplines of watershed management and hydrology, biometrics, forest health, forest management, fire science, and urban and community forestry.

Environmental Management

Offers advanced preparation in the disciplines that comprise the field of environmental management, including environmental assessment, planning, mitigation and policy formation relating to a wide range of landscapes and ecosystems.

Prerequisites

For consideration as a graduate student, an applicant will have completed a bachelor's degree in forestry at an accredited forestry four-year college or a related B.S. degree area such as environmental sciences

with a minimum grade point average of 2.75 in the last 90-quarter units. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Program of Study

Graduate students must file a formal study plan with their major professor, graduate committee, department, college and university graduate studies office no later than the end of the quarter in which the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 23 of which must be at the 500 level). The broad curriculum for the Master of Science degree in Forestry Sciences is:

- a) 20 units in the required core;
- b) 25 units in area of emphasis approved by the student's major professor and department head;
- c) completion of a thesis or scholarly project, and an oral and written examination. At the discretion of the graduate committee, the written examination may consist of submitting an article for publication to a referred journal.

BS Environmental Earth and Soil Sciences

Program Learning Objectives

1. Demonstrate critical thinking and problem solving skills.
2. Effectively communicate scientific and technical knowledge in a professional manner.
3. Demonstrate the ability to integrate and apply technical knowledge in the following key areas:
 - a. Geology & Climate – rock materials and processes of the lithosphere, plate tectonics; deformational histories, and past climates;
 - b. Soils & Water – morphology, ecology, chemistry, physics, and health;
 - c. Geography & Geospatial Technology – human cultural impacts, resource utilization trends and spatial patterns, geographic information systems and modeling;
 - d. Resource Management – effects of land management activities on, and restoration and rehabilitation of, soil and water resources.
4. Demonstrate proficiency in quantitative skills and information management specific to their discipline areas.
5. Exhibit an understanding of their professional and ethical responsibilities, including respect for diversity.
6. Promote life-long learning habits by exposing students to the discovery process of applied research and demonstration projects conducted by the faculty.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses

- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

ERSC/NR 140	Careers in Natural Resources Management and Environmental Sciences	1
ERSC 144	Introduction to Earth Science	4
ERSC 223	Rocks and Minerals	4
ERSC 303	Soil Erosion and Water Conservation	4
ERSC/GEOG 333	Human Impact on the Earth	4
ERSC 363	Undergraduate Seminar	2
SS 121	Introductory Soil Science	4
SS 221	Soil Health and Plant Nutrition	4
SS 321	Soil Morphology	4
SS 422	Soil Ecology	4
SS 432	Environmental Soil Physics	5
SS 423	Environmental Soil and Water Chemistry	5
Select one of the following courses to fulfill the senior project requirement:		3
ERSC/NR 476	Senior Project - Advanced Internship Experience in Environmental Science/Management	
ERSC/NR 477	Senior Project - Research Experience in Environmental Science	
ERSC/NR 478	Senior Project - Current Topics in Environmental Science/Management	
ERSC/NR 479	Senior Project - Independent Study	
BOT 121	General Botany (B2 & B4) ¹	4
CHEM 127	General Chemistry for Agriculture and Life Science I (B3 & B4) ¹	4
CHEM 128	General Chemistry for Agriculture and Life Science II	4
CHEM 129	General Chemistry for Agriculture and Life Science III	4
CHEM 312	Survey of Organic Chemistry	5
GEOG 150	Human Geography (D3) ¹	4
GEOG 301	Geography of Resource Utilization (D5) ¹	4
or GEOG 308	Global Geography	
GEOL 201	Physical Geology	3
GEOL 241	Physical Geology Laboratory	1
GEOL 415	Structural Geology	4
MATH 161	Calculus for the Life Sciences I (B1) ^{1,2}	4
or MATH 141	Calculus I	
NR/LA 218	Introduction to Geographic Information Systems (GIS)	3-4
or GEOG 318	Applications in GIS	
PHYS 121	College Physics I ³	4
or PHYS 141	General Physics IA	

STAT 218	Applied Statistics for the Life Sciences (B1) ¹	4
Concentration (32 units) or Approved Electives (20 units) in combination with Free Electives ^{4,5}		20-32
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		48
FREE ELECTIVES		
Free Electives		0-12
Total units		180-181

¹ Required in Major; also satisfies GE.

² Students in the Geology concentration need to take MATH 141 to meet prerequisites for courses in the concentration. Students interested in the Soil Geotechnical Studies career electives area need to take MATH 141 to meet prerequisites for courses in that area.

³ Students in the Geology concentration need to take PHYS 141 to meet prerequisites for courses in the concentration. Students interested in the Soil Geotechnical Studies career electives area need to take PHYS 141 to meet prerequisites for courses in that area.

⁴ Unless a concentration is declared, the default will be a combination of Approved Electives and Free Electives.

⁵ Students who do not declare a concentration are encouraged to use Approved Electives and Free Electives to earn a minor. See the below Approved Electives Guide for recommended minors.

Concentrations

- Geology (p. 133)
- Hydrology (p. 134)

Approved Electives Guide

Approved electives are courses that support the below career areas. Refer to number(s) next to each course to identify which courses align with each of the career areas. Consultation with an advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

1. Climate Change Science
2. Environmental Mitigation Strategies
3. Environmental Policy and Management
4. Environmental Soil Science
5. Forest and Environmental Practices
6. Geospatial Technology
7. Soil Geotechnical Studies
8. Sustainable Agriculture
9. Urban Forestry

Additionally, a student may earn one or more of the following minors through the appropriate selection of approved electives in combination with free electives (refer to advising materials for the minor):

- Anthropology and Geography
- Biology
- Geographic Information Systems for Agriculture
- Indigenous Studies in Natural Resources and the Environment
- Sustainable Environments

- Water Science

Approved Electives

Select from the following:

At least 8 units must be upper division (300-400 level)

No more than 6 units of ERSC 339, SS 339, or NR 339 may count towards the degree.

Courses used to meet a degree requirement cannot double count as an elective.

AEPS 123	Landscape Installation and Maintenance ^{5,9}
AEPS 124	Plant Propagation ^{5,9}
AEPS 233	Plant Materials I ^{5,9}
AEPS 234	Plant Materials II ^{5,9}
AEPS 203	Organic Enterprise ⁸
AEPS 230	Environmental Horticulture ^{8,9}
AEPS 244	Precision Farming ^{6,8}
AEPS 250	California Fruit Growing ⁸
AEPS 260	Introduction to Vegetable Science ⁸
AEPS 313	Agricultural Entomology ⁸
AEPS/AG 315	Organic Crop Production ⁸
AEPS 321	Weed Biology and Management ^{5,8}
AEPS 323	Plant Pathology ⁸
AEPS 327	Vertebrate Pest Management ⁵
AEPS 350	Abiotic Plant Problems ⁹
AEPS 381	Native Plants for California Landscapes ^{8,9}
AEPS 425	Arboriculture ^{5,9}
AEPS 431	Insect Pest Management ⁸
AEPS 441	Biological Control for Pest Management ⁸
AEPS 445	Cropping Systems ⁸
AG 339	Internship in Agriculture ⁸
AG/EDES/ENGR/ISLA/SCM/UNIV 350	The Global Environment ^{1,8}
AG 360	Holistic Management ^{5,8}
AGB 212	Agricultural Economics ⁸
AGB 312	Agricultural Policy ⁸
AGB 369	Agricultural Personnel Management ⁸
ANT 201 or ANT 202	Cultural Anthropology ¹ World Prehistory
ANT 250	Biological Anthropology ¹
ARCE 211 or CE 204	Structures I ⁷ Mechanics of Materials I
ARCE 212 or ME 211	Structures II ⁷ Engineering Statics
ARCE 223 or CE 207	Mechanics of Structural Members ⁷ Mechanics of Materials II
ARCE 422	Foundation Design ⁷
ASCI 112	Principles of Animal Science ⁸
ASCI 221	Introduction to Beef Production ⁸
ASCI 223	Systems of Small Ruminant Management ⁸

ASCI 311	Advanced Beef Cattle System Management ⁸
BIO 329	Vertebrate Field Zoology ²
BIO 427	Wildlife Management ²
BIO 435	Plant Physiology ⁵
BOT 326	Plant Ecology ²
BRAE 133	Introduction to Engineering Design Graphics ^{5,6}
BRAE 141	Agricultural Machinery Safety ⁸
BRAE 142	Agricultural Power and Machinery Management ⁸
BRAE 151	CAD for Agricultural Engineering ^{5,6}
BRAE 237	Introduction to Engineering Surveying ⁵
BRAE 239	Engineering Surveying ^{5,6}
BRAE/NR 247	Forest Surveying ⁵
BRAE 340	Irrigation Water Management ^{5,8}
BRAE 345	Aerial Photogrammetry and Remote Sensing ⁶
BRAE 348	Energy for a Sustainable Society ¹
BRAE 447	Advanced Surveying with GIS Applications ⁶
CE 112	Design Principles in Civil Engineering ⁶
CE 113	Computer Aided Drafting in Civil Engineering ⁶
CE 204	Mechanics of Materials I ⁷
CE 381 & CE 382	Geotechnical Engineering and Geotechnical Engineering Laboratory ⁷
or ARCE 421	Soil Mechanics
CHEM 313	Survey of Biochemistry and Biotechnology ⁴
CHEM 331	Quantitative Analysis ⁴
CHEM 341	Environmental Chemistry: Water Pollution ⁴
CRP 212	Introduction to Urban Planning ^{3,5,6,9}
CRP 336	Introduction to Environmental Planning ^{5,6}
CRP/NR 404	Environmental Law ¹
CRP/NR 408	Water Resource Law and Policy ^{2,3,5,8}
CRP 420	Land Use Law ^{3,5}
CSC/CPE 101	Fundamentals of Computer Science ⁶
CSC 235	Fundamentals of Computer Science for Scientists and Engineers I ⁶
ECON 221	Microeconomics ³
EDES 406	Sustainable Environments ⁸
ENVE 264	Environmental Fluid Mechanics ⁷
ENVE 324	Introduction to Air Pollution ¹
ERSC/GEOG 250	Physical Geography ¹
ERSC 323	Geomorphology ^{4,6}
ERSC/GEOG 325	Climate and Humanity ¹
ERSC/SS 339	Internship in Environmental Earth and Soil Sciences ^{1,2,3,4,5,6,7,8,9}

or NR 339	Internship in Forest and Natural Resources
ERSC/GEOG 414	Global and Regional Climatology ¹
ERSC/GEOG 415	Applied Meteorology and Climatology ¹
ES 241	Survey of Indigenous Studies ⁹
GEOG 308	Global Geography ¹
GEOG 328	Applications in Remote Sensing ^{1,6}
GEOG 440	Advanced-Applications in GIS ¹
GEOL 203	Fossils and the History of Life ¹
GEOL 205	Earthquakes ⁷
GEOL 305	Fundamentals of Seismology ⁷
GEOL 420	Applied Geophysics ⁷
JOUR 203	News Reporting and Writing ⁵
JOUR 205	Agricultural Communications ⁵
MATH 142	Calculus II ⁴
or MATH 162	Calculus for the Life Sciences II
MATH 143	Calculus III ⁷
MATH 241	Calculus IV ⁷
MCRO 221	Microbiology ⁵
MCRO 436	Microbial Ecology ⁵
ME 320	Consumer Energy Guide ¹
NR 141	Introduction to Forest Ecosystem Management ^{5,9}
NR 142	Environmental Management ^{8,9}
NR 204	Wildland Fire Control ^{5,9}
NR 208	Dendrology ^{5,9}
NR 215	Land and Resource Measurements ⁵
NR 260	Forest Practices and Environmental Protection ⁵
NR 306	Natural Resource Ecology and Habitat Management ^{2,5,6,9}
NR/ES 308	Fire and Society ⁵
NR 312	Technology of Wildland Fire Management ⁵
NR 315	Measurements and Sampling in Forested Environments ⁵
NR 320	Watershed Processes and Management ⁵
NR 324	Social Dimensions of Sustainable Food and Fiber Systems ⁸
NR 326	Natural Resources Economics and Valuation ^{1,3,5}
NR 340	Wildland Fire Management ^{5,9}
NR 350	Urban Forestry ^{5,9}
NR/ES 360	Ethnicity and the Land ⁵
NR 365	Silviculture and Vegetation Management ⁵
NR 400	Special Problems for Advanced Undergraduates ⁹
NR/ES 406	Indigenous Peoples and International Law and Policy ⁹
NR 418	Applied GIS ^{1,6,9}
NR 420	Watershed Assessment and Protection ⁵

NR 434	Wood Properties, Products and Sustainable Uses ^{5,9}
NR 435	Environmental Policy Analysis ^{1,3}
NR 455	Wildland-Urban Fire Protection ^{5,9}
NR 475	Sustainable Forest and Environmental Practices ^{1,2,3,4,5,6,7,8,9}
PHIL 340	Environmental Ethics ^{1,3}
PHYS 122	College Physics II ⁴
or PHYS 132	General Physics II
PHYS 133	General Physics III ⁷
PHYS 410	Physics of Solid Earth ⁷
POLS 112	American and California Government ³
POLS 245	Judicial Process ³
POLS 341	American Constitutional Law ³
POLS 343	Civil Rights in America ³
POLS 344	Civil Liberties ³
PSC 320	Energy, Society and the Environment ¹
RPTA 112	Introduction to Parks and Outdoor Recreation ³
RPTA 302	Environmental and Wilderness Education ³
RPTA 325	Leadership in Outdoor Experiences ³
SS/ERSC 200	Special Problems for Undergraduates (2) ⁴
SS/ERSC 270	Selected Topics (2) ⁴
SS 322	Soil Plant Relationships ^{4,8}
SS 431	Digital Soil Mapping ^{3,4,5,6,9}
SS/ERSC 400	Special Problems for Advanced Undergraduates ⁴
SS/NR/BIO 421	Wetlands ^{2,4,5}
SS 431	Digital Soil Mapping ^{3,4,5,6,9}
SS 440	Forest and Range Soils ^{4,5,9}
SS 442	Vadose Zone and Groundwater Processes ⁴
SS 444	Soil Judging ⁴
SS/ERSC 470	Selected Advanced Topics ⁴
SS/ERSC 471	Selected Advanced Laboratory ⁴
SS 508	Environmental Assessment for Erosion Control ⁴
SS 522	Advanced Soil Fertility ⁴
SS 582	GIS in Advanced Land Management ⁴
STAT 313	Applied Experimental Design and Regression Models ⁶
STAT 331	Statistical Computing with R ⁶
UNIV/POLS 333	World Food Systems ⁸
UNIV 391	Appropriate Technology for the World's People: Development ⁸
WVIT 233	Basic Viticulture ⁸
WVIT 331	Advanced Viticulture - Fall ⁸
WVIT 332	Advanced Viticulture - Winter ⁸
WVIT 333	Advanced Viticulture - Spring ⁸

WVIT 428 Winegrape Vineyard Management ⁸

Any upper division AEPS, AG, ANT, BIO, BOT, BRAE, CHEM, COMS, EDES, GEOG, JOUR, MCRO, or UNIV courses

General Education (GE) Requirements

- 72 units required, 24 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Major) ¹	0
B2	Life Science (4 units in Major) ¹	0
B3	Physical Science (4 units in Major) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions (4 units in Major) ¹	0
D4	Self Development (CSU Area E)	4
D5	Upper-division elective (4 units in Major) ¹	0
Area F	Technology	
F	Upper-division elective (BRAE 340 recommended)	4
Total units		48

¹ Required in Major; also satisfies GE.

Geology Concentration

ERSC 323	Geomorphology	4
GEOL 206	Geologic Excursions	1
GEOL 305	Fundamentals of Seismology	4
GEOL 310	Igneous and Metamorphic Petrology	4
GEOL 330	Principles of Stratigraphy	4
GEOL/ERSC 401	Field-Geology Methods	4
GEOL/ERSC 402	Geologic Mapping	4
GEOL 420	Applied Geophysics	3

MATH 142	Calculus II	4
Total units		32

Hydrology Concentration

MATH 162 or MATH 142	Calculus for the Life Sciences II Calculus II	4
NR 320	Watershed Processes and Management	4
NR 420	Watershed Assessment and Protection	4
PHYS 122 or PHYS 132	College Physics II General Physics II	4
SS 431	Digital Soil Mapping	4
SS 442	Vadose Zone and Groundwater Processes	4
Approved electives		
Select from the following:		8
BRAE 236	Principles of Irrigation	
BRAE 331	Irrigation Theory	
BRAE 340	Irrigation Water Management	
BRAE 345	Aerial Photogrammetry and Remote Sensing	
BRAE 435	Drainage	
BRAE 532	Water Wells and Pumps	
ERSC 323	Geomorphology	
NR/CRP 408	Water Resource Law and Policy	
NR 418	Applied GIS	
PHYS 107	Introduction to Meteorology	
SS/BIO/NR 421	Wetlands	
SS 440	Forest and Range Soils	
Total units		32

BS Environmental Management and Protection

Program Learning Objectives

- Demonstrate critical thinking/problem solving.
- Effectively communicate, work in teams, and develop leadership skills.
- Integrate and apply technical knowledge.
- Demonstrate proficiency in quantitative skills and information management.
- Exhibit an understanding of ethics and sustainability principles.
- Engage in lifelong learning.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section for this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA

- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

NR/ERSC 140	Careers in Natural Resources Management and Environmental Sciences	1
NR 142	Environmental Management	3
NR 208 or BIO 162	Dendrology ¹ Introduction to Organismal Form and Function	4
NR 215	Land and Resource Measurements	1
NR/LA 218	Introduction to Geographic Information Systems (GIS)	3
NR 306	Natural Resource Ecology and Habitat Management	4
NR 314	Environmental Life-Cycle Analysis	4
NR 320 or NR 402 or ERSC 303	Watershed Processes and Management ² Forest Health Soil Erosion and Water Conservation	4
NR 326	Natural Resources Economics and Valuation	4
NR 335	Conflict Management in Natural Resources	4
NR/CRP 404 or NR/CRP 408	Environmental Law Water Resource Law and Policy	3
NR 416	Environmental Impact Analysis and Management	4
NR 425	Applied Resource Analysis and Assessment	4
NR 435	Environmental Policy Analysis	4
NR 465	Ecosystem Management	4
Select one of the following courses to fulfill the senior project requirement:		3
NR/ERSC 476	Senior Project - Advanced Internship Experience in Environmental Science/Management	
NR/ERSC 477	Senior Project - Research Experience in Environmental Science	
NR/ERSC 478	Senior Project - Current Topics in Environmental Science/Management	
NR/ERSC 479	Senior Project - Independent Study	
BIO 161 or BOT 121	Introduction to Cell and Molecular Biology (B2 & B4) ^{1,3} General Botany	4
BRAE 237 or BRAE 247 or BRAE 239	Introduction to Engineering Surveying Forest Surveying Engineering Surveying	2-4
BRAE 348 or ENVE 324	Energy for a Sustainable Society (Area F) ³ Introduction to Air Pollution	4
CHEM 127	General Chemistry for Agriculture and Life Science I (B3) ³	4
GEOL 201	Physical Geology	3

MATH 161	Calculus for the Life Sciences I (B1) 3,4	4
or MATH 221	Calculus for Business and Economics	
PHYS 121	College Physics I	4
SS 121	Introductory Soil Science	4
STAT 217	Introduction to Statistical Concepts and Methods (B1) ³	4
or STAT 218	Applied Statistics for the Life Sciences	
Concentration (41 units) or Approved Electives (29 units) in combination with Free Electives ^{5,6}		29-41
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		52
FREE ELECTIVES		
Free Electives		0-12
Total units		180-182

- ¹ Students in the Wildlife Biology concentration need to take BIO 161 and BIO 162 to meet prerequisites for courses in the concentration.
- ² Students in the Watershed Management and Hydrology concentration need to take NR 320 to meet prerequisites for courses in the concentration.
- ³ Required in Major; also satisfies GE.
- ⁴ Students in the Watershed Management and Hydrology concentration need to take MATH 161 to meet prerequisites for courses in the concentration.
- ⁵ Unless a concentration is declared, the default will be a combination of Approved Electives and Free Electives.
- ⁶ Students who do not declare a concentration are encouraged to use Approved Electives and Free Electives to earn one or more minors. See the below Approved Electives Guide for recommended minors.

Concentrations

- Watershed Management and Hydrology (p. 137)
- Wildlife Biology (p. 138)

Approved Electives Guide

Approved electives are courses that support the below career areas. Refer to number(s) next to each course to identify which courses align with each of the career areas. Consultation with an advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

1. Climate Change Science
2. Environmental Mitigation Strategies
3. Environmental Policy and Management
4. Environmental Soil Science
5. Forest and Environmental Practices
6. Geology
7. Geospatial Technology
8. Sustainable Agriculture
9. Urban Forestry

Additionally, a student may earn one or more of the following minors through the appropriate selection of approved electives in combination with free electives (refer to advising materials for the minor):

- Anthropology and Geography
- Biology
- Geographic Information Systems for Agriculture
- Geology
- Indigenous Studies in Natural Resources and the Environment
- Sustainable Environments
- Water Science

Approved Electives

Select from the following:

At least 6 units must be upper division (300-400 level)

Courses used to meet a degree requirement cannot double count as an elective.

AEPS 123	Landscape Installation and Maintenance ^{5,9}
AEPS 124	Plant Propagation ^{5,9}
AEPS 203	Organic Enterprise ⁸
AEPS 230	Environmental Horticulture ^{8,9}
AEPS 233	Plant Materials I ^{5,9}
AEPS 234	Plant Materials II ^{5,9}
AEPS 244	Precision Farming ^{7,8}
AEPS 250	California Fruit Growing ⁸
AEPS 260	Introduction to Vegetable Science ⁸
AEPS 313	Agricultural Entomology ⁸
AEPS/AG 315	Organic Crop Production ⁸
AEPS 321	Weed Biology and Management ^{5,8}
AEPS 323	Plant Pathology ⁸
AEPS 327	Vertebrate Pest Management ⁵
AEPS 350	Abiotic Plant Problems ⁹
AEPS 381	Native Plants for California Landscapes ^{8,9}
AEPS 425	Arboriculture ^{5,9}
AEPS 431	Insect Pest Management ⁸
AEPS 441	Biological Control for Pest Management ⁸
AEPS 445	Cropping Systems ⁸
AG 339	Internship in Agriculture ⁸
AG/EDES/ENGR/ISLA/SCM/UNIV 350	The Global Environment ⁸
AG 360	Holistic Management ^{5,8}
AGB 212	Agricultural Economics ⁸
AGB 312	Agricultural Policy ⁸
AGB 369	Agricultural Personnel Management ⁸
ANT 201	Cultural Anthropology ¹
or ANT 202	World Prehistory
or GEOG 150	Human Geography
ANT 250	Biological Anthropology ¹
ASCI 112	Principles of Animal Science ⁸
ASCI 221	Introduction to Beef Production ⁸
ASCI 223	Systems of Small Ruminant Management ⁸
ASCI 311	Advanced Beef Cattle System Management ⁸

BIO 329	Vertebrate Field Zoology ²	GEOL 420	Applied Geophysics ⁶
BIO 427	Wildlife Management ²	GEOL/ERSC 401	Field-Geology Methods ⁶
BIO 435	Plant Physiology ⁵	GEOL/ERSC 402	Geologic Mapping ⁶
BOT 121	General Botany ⁵	JOUR 203	News Reporting and Writing ⁵
BRAE 133	Introduction to Engineering Design Graphics ^{5,7}	JOUR 205	Agricultural Communications ⁵
BRAE 141	Agricultural Machinery Safety ⁸	MATH 142	Calculus II ⁶
BRAE 142	Agricultural Power and Machinery Management ⁸	or MATH 162	Calculus for the Life Sciences II
BRAE 151	CAD for Agricultural Engineering ^{5,7}	MCRO 221	Microbiology ⁵
BRAE 239	Engineering Surveying ⁷	MCRO 436	Microbial Ecology ⁵
BRAE 340	Irrigation Water Management ^{5,8}	NR 204	Wildland Fire Control ^{5,9}
BRAE 345	Aerial Photogrammetry and Remote Sensing ⁷	NR/ES 308	Fire and Society ⁵
BRAE 348	Energy for a Sustainable Society ¹	NR 312	Technology of Wildland Fire Management ⁵
BRAE 447	Advanced Surveying with GIS Applications ⁷	NR 324	Social Dimensions of Sustainable Food and Fiber Systems ⁸
CE 112	Design Principles in Civil Engineering ⁷	NR 339	Internship in Forest and Natural Resources ^{1,2,3,4,5,6,7,8,9}
CE 113	Computer Aided Drafting in Civil Engineering ⁷	or ERSC 339	Internship in Environmental Earth and Soil Sciences
CHEM 128	General Chemistry for Agriculture and Life Science II ⁴	NR 340	Wildland Fire Management ^{5,8,9}
CHEM 129	General Chemistry for Agriculture and Life Science III ⁴	NR 350	Urban Forestry ^{5,9}
CHEM 312	Survey of Organic Chemistry ⁴	NR/ES 360	Ethnicity and the Land ⁵
CRP 212	Introduction to Urban Planning ^{2,5,7,9}	NR 400	Special Problems for Advanced Undergraduates ^{5,9}
CRP 336	Introduction to Environmental Planning ^{5,7}	NR/CRP 404	Environmental Law ^{2,5,8,9}
CRP 420	Land Use Law ^{3,5}	NR/ES 406	Indigenous Peoples and International Law and Policy ⁹
CSC 235	Fundamentals of Computer Science for Scientists and Engineers I ⁷	NR/CRP 408	Water Resource Law and Policy ^{2,3,5,8}
ECON 221	Microeconomics ³	NR 418	Applied GIS ^{1,5,7,9}
EDES 406	Sustainable Environments ⁸	NR 420	Watershed Assessment and Protection ⁵
ERSC 223	Rocks and Minerals ^{3,4,5,6,7}	NR/BIO/SS 421	Wetlands ^{2,4,5}
ERSC/GEOG 250	Physical Geography ^{1,7}	NR 434	Wood Properties, Products and Sustainable Uses ^{5,9}
ERSC 303	Soil Erosion and Water Conservation ^{4,8}	NR 435	Environmental Policy Analysis ^{1,3}
ERSC 323	Geomorphology ^{4,6}	NR 455	Wildland-Urban Fire Protection ^{5,9}
ERSC/GEOG 325	Climate and Humanity ¹	NR 475	Sustainable Forest and Environmental Practices ^{1,2,3,4,5,7,8,9}
ERSC/GEOG 414	Global and Regional Climatology ¹	PHIL 340	Environmental Ethics ³
ERSC/GEOG 415	Applied Meteorology and Climatology ¹	PHYS 122	College Physics II ⁶
ES 241	Survey of Indigenous Studies ⁹	or PHYS 132	General Physics II
GEOG 301	Geography of Resource Utilization ^{1,8}	POLS 112	American and California Government ³
GEOG 308	Global Geography ¹	POLS 245	Judicial Process ³
GEOG 328	Applications in Remote Sensing ^{1,7}	POLS 341	American Constitutional Law ³
GEOL 206	Geologic Excursions ⁶	POLS 343	Civil Rights in America ³
GEOL 241	Physical Geology Laboratory ⁶	POLS 344	Civil Liberties ³
GEOL 305	Fundamentals of Seismology ⁶	RPTA 112	Introduction to Parks and Outdoor Recreation ²
GEOL 310	Igneous and Metamorphic Petrology ⁶	RPTA 302	Environmental and Wilderness Education ²
GEOL 330	Principles of Stratigraphy ⁶	RPTA 325	Leadership in Outdoor Experiences ²
GEOL 415	Structural Geology ⁶	SS 221	Soil Health and Plant Nutrition ^{4,5,8}
		SS 321	Soil Morphology ^{3,4,5,7}

SS 322	Soil Plant Relationships ^{4,8}
SS 422	Soil Ecology ⁴
SS 423	Environmental Soil and Water Chemistry ⁴
SS 431	Digital Soil Mapping ^{2,4,5,7,9}
SS 432	Environmental Soil Physics ⁴
SS 440	Forest and Range Soils ^{4,5,9}
SS 442	Vadose Zone and Groundwater Processes ⁴
SS 444	Soil Judging ⁴
UNIV/POLS 333	World Food Systems ⁸
UNIV 391	Appropriate Technology for the World's People: Development ⁸
WVIT 233	Basic Viticulture ⁸
WVIT 331	Advanced Viticulture - Fall ⁸
WVIT 332	Advanced Viticulture - Winter ⁸
WVIT 333	Advanced Viticulture - Spring ⁸
WVIT 428	Winegrape Vineyard Management ⁸
Any upper division AEPS, AG, ANT, BIO, BOT, BRAE, CHEM, COMS, CRP, EDES, ERSC, GEOG, JOUR, LA, MCRO, NR, SS, or UNIV courses	

General Education (GE) Requirements

- 72 units required, 20 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Major) ¹	0
B2	Life Science (4 units in Major) ¹	0
B3	Physical Science (4 units in Major) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	

F	Upper-division elective (4 units in Major) ¹	0
Total units		52

¹ Required in Major; also satisfies GE.

Watershed Management and Hydrology Concentration - Environmental Management and Protection

CHEM 128	General Chemistry for Agriculture and Life Science II	4
CHEM 312	Survey of Organic Chemistry	5
MATH 162	Calculus for the Life Sciences II	4
NR 420	Watershed Assessment and Protection	4
PHYS 122	College Physics II	4
SS 321	Soil Morphology	4
SS 440	Forest and Range Soils	4
SS 442	Vadose Zone and Groundwater Processes	4

Approved electives ^{1,2}

Select from the following:		8
BRAE 236	Principles of Irrigation	
BRAE 340	Irrigation Water Management	
BRAE 345	Aerial Photogrammetry and Remote Sensing	
BRAE 435	Drainage	
BRAE 532	Water Wells and Pumps	
ERSC 303	Soil Erosion and Water Conservation	
ERSC 323	Geomorphology	
GEOG 241	Physical Geology Laboratory	
NR 260	Forest Practices and Environmental Protection	
NR 315	Measurements and Sampling in Forested Environments	
NR 339	Internship in Forest and Natural Resources	
NR/CRP 408	Water Resource Law and Policy	
NR 418	Applied GIS	
NR/BIO/SS 421	Wetlands	
NR 475	Sustainable Forest and Environmental Practices	
PHYS 107	Introduction to Meteorology	
SS 431	Digital Soil Mapping	
SS 432	Environmental Soil Physics	
STAT 313	Applied Experimental Design and Regression Models	
Total units		41

¹ If a course is taken to meet a major requirement, it cannot be double-counted as an approved elective for the concentration.

² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Wildlife Biology Concentration - Environmental Management and Protection

ASCI 329	Principles of Range Management	4
BIO 321	Mammalogy	4
BIO 323	Ornithology	4
BIO 327	Wildlife Ecology	4
BIO 401	Principles of Conservation Biology	4
or BIO 444	Population Ecology	4
BIO 427	Wildlife Management	4
BOT 313	Taxonomy of Vascular Plants	4
BOT 433	Field Botany: California Plant Diversity	5
Approved Electives¹		
Select from the following:		8
BIO 160	Diversity and History of Life	
BIO 263	Introductory Ecology and Evolution	
BIO 322	Ichthyology	
BIO 324	Herpetology	
BIO 329	Vertebrate Field Zoology	
BIO 330	Extended Field Biology Activity	
BIO 335	General Entomology	
BIO 336	Invertebrate Zoology	
BIO 400	Special Problems for Advanced Undergraduates	
BIO 401	Principles of Conservation Biology	
BIO 415	Biogeography	
BIO 419	Analytical Methods in Ecology	
BIO 427	Wildlife Management	
BIO 429	Parasitology	
BIO 434	Environmental Physiology	
BIO 442	Behavioral Ecology	
BIO 444	Population Ecology	
BOT 326	Plant Ecology	
Total units		41

BS Forestry and Natural Resources Program Learning Objectives

- Demonstrate critical thinking/problem solving.
- Effectively communicate, work in teams, and develop leadership skills.
- Integrate and apply technical knowledge.
- Demonstrate proficiency in quantitative skills and information management.
- Exhibit an understanding of ethics and sustainability principles.
- Engage in lifelong learning.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, student must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

NR 140	Careers in Natural Resources Management and Environmental Sciences	1
NR 141	Introduction to Forest Ecosystem Management	3
NR 208	Dendrology	4
NR 215	Land and Resource Measurements	1
NR/LA 218	Introduction to Geographic Information Systems (GIS)	3
NR 260	Forest Practices and Environmental Protection	4
NR 306	Natural Resource Ecology and Habitat Management	4
NR 307	Fire Ecology	3
NR 315	Measurements and Sampling in Forested Environments	4
NR 320	Watershed Processes and Management	4
NR 326	Natural Resources Economics and Valuation	4
NR 335	Conflict Management in Natural Resources	4
NR 365	Silviculture and Vegetation Management	4
NR 402	Forest Health	4
NR 414	Sustainable Forest Management	4
NR 416	Environmental Impact Analysis and Management	4
NR 435	Environmental Policy Analysis	4
NR 465	Ecosystem Management	4
Select one of the following courses to fulfill the senior project requirement:		3

NR/ERSC 476	Senior Project - Advanced Internship Experience in Environmental Science/Management
NR/ERSC 477	Senior Project - Research Experience in Environmental Science
NR/ERSC 478	Senior Project - Current Topics in Environmental Science/Management
NR/ERSC 479	Senior Project - Independent Study

Concentration (29 - 33 units) or Approved Electives (18 units) in combination with Free Electives^{1,2} 18-33

SUPPORT COURSES

ASCI 329	Principles of Range Management ³	3-4
or ASCI 370	Rangeland Improvements	
or BIO 427	Wildlife Management	
or PHYS 121	College Physics I	
BIO 161	Introduction to Cell and Molecular Biology ⁴	3-4
or BRAE 345	Aerial Photogrammetry and Remote Sensing	
BOT 121	General Botany (B2 & B4) ⁵	4
BRAE/NR 247	Forest Surveying	2-4
or BRAE 237	Introduction to Engineering Surveying	
or BRAE 239	Engineering Surveying	
CHEM 127	General Chemistry for Agriculture and Life Science I (B3) ⁵	4
MATH 161	Calculus for the Life Sciences I (B1) ^{5, 6}	4
or MATH 221	Calculus for Business and Economics	
SS 121	Introductory Soil Science	4
STAT 217	Introduction to Statistical Concepts and Methods (B1) ⁵	4
or STAT 218	Applied Statistics for the Life Sciences	

GENERAL EDUCATION (GE)

(See GE program requirements below.) 56

FREE ELECTIVES

Free Electives	0-12
Total units	180-187

- ¹ Unless a concentration is declared, the default will be a combination of Approved Electives and Free Electives.
- ² Students who do not declare a concentration are encouraged to use Approved Electives and Free Electives to earn a minor. See the below Approved Electives Guide for recommended minors.
- ³ Students in the Watershed Management and Hydrology concentration must take PHYS 121.
- ⁴ Students in the Wildlife Biology concentration must take BIO 161.
- ⁵ Required in Support; also satisfies GE.
- ⁶ Students in the Watershed Management and Hydrology concentration must take MATH 161.

Concentrations

- Watershed Management and Hydrology (p. 141)
- Wildlife Biology (p. 142)
- Wildland Fire and Fuels Management (p. 142)

Approved Electives Guide

Approved electives are courses that support the below career areas. Refer to number(s) next to each course to identify which courses align with each of the career areas. Consultation with an advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

1. Climate Change Science
2. Environmental Mitigation Strategies
3. Environmental Policy and Management

4. Environmental Soil Science
5. Forest and Environmental Practices
6. Geology
7. Geospatial Technology
8. Sustainable Agriculture
9. Urban Forestry

Additionally, a student may earn one or more of the following minors through the appropriate selection of approved electives in combination with free electives (refer to advising materials for minor):

- Anthropology and Geography
- Biology
- Geographic Information Systems for Agriculture
- Geology
- Indigenous Studies in Natural Resources and the Environment
- Sustainable Environments
- Water Science

Approved Electives

Select from the following:

Courses used to meet a degree requirement cannot double count as an elective.

AEPS 123	Landscape Installation and Maintenance ^{5, 9}
AEPS 124	Plant Propagation ^{5, 9}
AEPS 203	Organic Enterprise ⁸
AEPS 230	Environmental Horticulture ^{8, 9}
AEPS 233	Plant Materials I ^{5, 9}
AEPS 234	Plant Materials II ^{5, 9}
AEPS 244	Precision Farming ^{7, 8}
AEPS 250	California Fruit Growing ⁸
AEPS 260	Introduction to Vegetable Science ⁸
AEPS 313	Agricultural Entomology ⁸
AEPS/AG 315	Organic Crop Production ⁸
AEPS 321	Weed Biology and Management ^{5, 8}
AEPS 323	Plant Pathology ⁸
AEPS 327	Vertebrate Pest Management ⁵
AEPS 350	Abiotic Plant Problems ⁹
AEPS 381	Native Plants for California Landscapes ^{8, 9}
AEPS 425	Arboriculture ^{5, 9}
AEPS 431	Insect Pest Management ⁸
AEPS 441	Biological Control for Pest Management ⁸
AEPS 445	Cropping Systems ⁸
AG 339	Internship in Agriculture ⁸
AG/EDES/ENGR/ISLA/SCM/UNIV 350	The Global Environment ⁸
AG 360	Holistic Management ^{5, 8}
AGB 212	Agricultural Economics ⁸
AGB 312	Agricultural Policy ⁸
AGB 369	Agricultural Personnel Management ⁸
ANT 201	Cultural Anthropology ¹

or ANT 202	World Prehistory	ES 241	Survey of Indigenous Studies ⁹
or GEOG 150	Human Geography	GEOG 301	Geography of Resource Utilization ^{1,8}
ANT 250	Biological Anthropology ¹	GEOG 308	Global Geography ¹
ASCI 112	Principles of Animal Science ⁸	GEOG 328	Applications in Remote Sensing ^{1,7}
ASCI 221	Introduction to Beef Production ⁸	GEOL 201	Physical Geology ⁶
ASCI 223	Systems of Small Ruminant Management ⁸	GEOL 206	Geologic Excursions ⁶
ASCI 311	Advanced Beef Cattle System Management ⁸	GEOL 241	Physical Geology Laboratory ⁶
BIO 329	Vertebrate Field Zoology ²	GEOL 305	Fundamentals of Seismology ⁶
BIO 427	Wildlife Management ²	GEOL 310	Igneous and Metamorphic Petrology ⁶
BIO 435	Plant Physiology ⁵	GEOL 330	Principles of Stratigraphy ⁶
BRAE 133	Introduction to Engineering Design Graphics ^{5,7}	GEOL 415	Structural Geology ⁶
BRAE 141	Agricultural Machinery Safety ⁸	GEOL 420	Applied Geophysics ⁶
BRAE 142	Agricultural Power and Machinery Management ⁸	JOUR 203	News Reporting and Writing ⁵
BRAE 151	CAD for Agricultural Engineering ^{5,7}	JOUR 205	Agricultural Communications ⁵
BRAE 239	Engineering Surveying ⁷	MATH 142	Calculus II ⁶
BRAE 340	Irrigation Water Management ^{5,8}	or MATH 162	Calculus for the Life Sciences II
BRAE 345	Aerial Photogrammetry and Remote Sensing ⁷	MCRO 221	Microbiology ⁵
BRAE 348	Energy for a Sustainable Society ¹	MCRO 436	Microbial Ecology ⁵
BRAE 447	Advanced Surveying with GIS Applications ⁷	NR 142	Environmental Management ⁸
CE 112	Design Principles in Civil Engineering ⁷	NR 204	Wildland Fire Control ^{5,9}
CE 113	Computer Aided Drafting in Civil Engineering ⁷	NR/ES 308	Fire and Society ⁵
CHEM 128	General Chemistry for Agriculture and Life Science II ⁴	NR 312	Technology of Wildland Fire Management ⁵
CHEM 129	General Chemistry for Agriculture and Life Science III ⁴	NR 324	Social Dimensions of Sustainable Food and Fiber Systems ⁸
CHEM 312	Survey of Organic Chemistry ⁴	NR 339	Internship in Forest and Natural Resources ^{1,2,3,4,5,6,7,8,9}
CRP 212	Introduction to Urban Planning ^{3,5,7,9}	or ERSC 339	Internship in Environmental Earth and Soil Sciences
CRP 336	Introduction to Environmental Planning ^{5,7}	NR 340	Wildland Fire Management ^{5,8,9}
CRP 420	Land Use Law ^{3,5}	NR 350	Urban Forestry ^{5,9}
CSC 235	Fundamentals of Computer Science for Scientists and Engineers I ⁷	NR/ES 360	Ethnicity and the Land ⁵
ECON 221	Microeconomics ³	NR 400	Special Problems for Advanced Undergraduates ^{5,9}
ECON 431	Environmental Economics ³	NR/CRP 404	Environmental Law ^{2,3,5,8,9}
EDES 406	Sustainable Environments ⁸	NR/ES 406	Indigenous Peoples and International Law and Policy ⁹
ERSC 223	Rocks and Minerals ^{3,4,5,6,7}	NR/CRP 408	Water Resource Law and Policy ^{2,3,5,8}
ERSC/GEOG 250	Physical Geography ¹	NR 418	Applied GIS ^{1,5,7,9}
ERSC 303	Soil Erosion and Water Conservation ^{4,8}	NR 420	Watershed Assessment and Protection ⁵
ERSC 323	Geomorphology ^{4,6}	NR/BIO/SS 421	Wetlands ^{2,4,5}
ERSC/GEOG 325	Climate and Humanity ¹	NR 434	Wood Properties, Products and Sustainable Uses ^{5,9}
ERSC/GEOL 401	Field-Geology Methods ⁶	NR 455	Wildland-Urban Fire Protection ^{5,9}
ERSC 402	Geologic Mapping ⁶	NR 475	Sustainable Forest and Environmental Practices ^{1,2,3,4,5,6,7,8,9}
ERSC/GEOG 414	Global and Regional Climatology ¹	PHIL 340	Environmental Ethics ³
ERSC/GEOG 415	Applied Meteorology and Climatology ¹	PHYS 122	College Physics II ⁶
		or PHYS 132	General Physics II
		POLS 112	American and California Government ³

POLS 245	Judicial Process ³	
POLS 341	American Constitutional Law ³	
POLS 343	Civil Rights in America ³	
POLS 344	Civil Liberties ³	
RPTA 112	Introduction to Parks and Outdoor Recreation ³	
RPTA 302	Environmental and Wilderness Education ³	
RPTA 325	Leadership in Outdoor Experiences ³	
SS 221	Soil Health and Plant Nutrition ^{4, 5, 8}	
SS 321	Soil Morphology ^{3, 4, 5, 7}	
SS 322	Soil Plant Relationships ^{4, 8}	
SS 422	Soil Ecology ⁴	
SS 423	Environmental Soil and Water Chemistry ⁴	
SS 431	Digital Soil Mapping ^{3, 4, 5, 7, 9}	
SS 432	Environmental Soil Physics ⁴	
SS 440	Forest and Range Soils ^{4, 5, 7, 9}	
SS 442	Vadose Zone and Groundwater Processes ⁴	
SS 444	Soil Judging ⁴	
UNIV/POLS 333	World Food Systems ⁸	
UNIV 391	Appropriate Technology for the World's People: Development ⁸	
WVIT 233	Basic Viticulture ⁸	
WVIT 331	Advanced Viticulture - Fall ⁸	
WVIT 332	Advanced Viticulture - Winter ⁸	
WVIT 333	Advanced Viticulture - Spring ⁸	
WVIT 428	Winegrape Vineyard Management ⁸	
Any upper division AEPS, AG, ANT, BIO, BOT, BRAE, CHEM, COMS, CRP, EDES, ERSC, GEOG, JOUR, LA, MCRO, NR, SS or UNIV courses		

General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4

C3	Fine/Performing Arts	4
C4	Upper-division elective (no NR course, except ES/NR 360)	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective (no NR course, except ES/NR 308)	4
Area F	Technology	
F	Upper-division elective	4
Total units		56

¹ Required in Support; also satisfies GE.

Watershed Management and Hydrology Concentration - Forestry and Natural Resources

CHEM 128	General Chemistry for Agriculture and Life Science II	4
MATH 162	Calculus for the Life Sciences II	4
NR 420	Watershed Assessment and Protection	4
PHYS 122	College Physics II	4
SS 321	Soil Morphology	4
SS 440	Forest and Range Soils	4
Approved electives ^{1, 2}		
Select from the following:		8
BRAE 236	Principles of Irrigation	
BRAE 340	Irrigation Water Management	
BRAE 435	Drainage	
BRAE 532	Water Wells and Pumps	
CHEM 312	Survey of Organic Chemistry	
ERSC 303	Soil Erosion and Water Conservation	
ERSC 323	Geomorphology	
GEOL 201	Physical Geology	
GEOL 241	Physical Geology Laboratory	
NR 339	Internship in Forest and Natural Resources	
NR/CRP 408	Water Resource Law and Policy	
NR 418	Applied GIS	
NR/BIO/SS 421	Wetlands	
NR/HNRS 475	Sustainable Forest and Environmental Practices	
SS 432	Environmental Soil Physics	
STAT 313	Applied Experimental Design and Regression Models	
Total units		32

- ¹ If a course is taken to meet a requirement, it cannot be double-counted as an approved elective for the concentration.
- ² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Wildlife Biology Concentration - Forestry and Natural Resources

BIO 162	Introduction to Organismal Form and Function	4
BIO 321	Mammalogy	4
BIO 323	Ornithology	4
BIO 327	Wildlife Ecology	4
BIO 401	Principles of Conservation Biology	4
or BIO 444	Population Ecology	
BOT 313	Taxonomy of Vascular Plants	4
BOT 433	Field Botany: California Plant Diversity	5
Approved Electives ¹		
Select from the following:		4
BIO 160	Diversity and History of Life	
BIO 322	Ichthyology	
BIO 329	Vertebrate Field Zoology	
BIO 330	Extended Field Biology Activity	
BIO 400	Special Problems for Advanced Undergraduates	
BIO 401	Principles of Conservation Biology	
BIO 419	Analytical Methods in Ecology	
BIO 427	Wildlife Management	
BIO 434	Environmental Physiology	
BIO 444	Population Ecology	
BOT 326	Plant Ecology	
MSCI 437	Marine Botany	
MSCI 439	Fisheries Science and Resource Management	
Total units		33

- ¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Wildland Fire and Fuels Management Concentration

NR 204	Wildland Fire Control	3
NR 340	Wildland Fire Management	3
NR 455	Wildland-Urban Fire Protection	4
Approved electives ¹		
Select from the following:		19
AEPS 230	Environmental Horticulture	
AEPS 381	Native Plants for California Landscapes	
AEPS 425	Arboriculture	

BOT 326	Plant Ecology	
CRP 212	Introduction to Urban Planning	
CRP 336	Introduction to Environmental Planning	
CRP 342	Environmental Planning Methods	
CRP 458	Local Hazard Mitigation Planning and Design	
LA 221	California Plants and Plant Communities	
NR/RPTA 203	Resource Law Enforcement	
NR/ES 308	Fire and Society	
NR 312	Technology of Wildland Fire Management	
NR 339	Internship in Forest and Natural Resources	
NR 350	Urban Forestry	
NR/CRP 404	Environmental Law	
NR/ES 406	Indigenous Peoples and International Law and Policy	
NR/CRP 408	Water Resource Law and Policy	
NR 418	Applied GIS	
NR 420	Watershed Assessment and Protection	
NR 425	Applied Resource Analysis and Assessment	
NR/HNRS 475	Sustainable Forest and Environmental Practices	
PHYS 107	Introduction to Meteorology	
SS 321	Soil Morphology	
SS 440	Forest and Range Soils	
Any CSU-transferable course recognized by Cal Regional Fire Academy		
Any CSU-transferable fire technology course		
Any CSU-transferable emergency medical technician course		
Total units		29

- ¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Environmental Soil Science Minor

Required Courses

ERSC 303	Soil Erosion and Water Conservation	4
SS 121	Introductory Soil Science (B5)	4
SS 221	Soil Health and Plant Nutrition	4
or ERSC 223	Rocks and Minerals	
SS 321	Soil Morphology	4

Approved Electives

Select from the following:		11-14
BIO/NR/SS 421	Wetlands	
ERSC 323	Geomorphology	
SS 322	Soil Plant Relationships	
SS 422	Soil Ecology	

SS 423	Environmental Soil and Water Chemistry
SS 431	Digital Soil Mapping
SS 432	Environmental Soil Physics
SS 440	Forest and Range Soils
SS 442	Vadose Zone and Groundwater Processes
SS 444	Soil Judging

Total units

27-30

Indigenous Studies in Natural Resources and the Environment Minor

Required Courses

ES 241	Survey of Indigenous Studies	4
ES/NR 360	Ethnicity and the Land	4
NR 141	Introduction to Forest Ecosystem Management	3
or NR 142	Environmental Management	

Emphasis

Select from the following: 8

ERSC/GEOG 325	Climate and Humanity
ES/NR 406	Indigenous Peoples and International Law and Policy
ES 450	Fieldwork in Comparative Ethnic Studies
NR/ES 308	Fire and Society
NR 323	Human Dimensions in Natural Resources Management
NR 335	Conflict Management in Natural Resources
PHIL 340	Environmental Ethics

Approved Electives ¹

At least 4 units must be upper division (300-400).

Select from the following: 8

Ethnic Studies

ES/CRP 215	Planning for and with Multiple Publics
ES 243	Survey of Latino/a Studies
ES 321	Native American Cultural Images
ES/ARCH 326	Native American Architecture and Place
ES 380	Critical Race Theory
ES 381	The Social Construction of Whiteness
ES 390	Research Methodology in Comparative Ethnic Studies
ES/NR 406	Indigenous Peoples and International Law and Policy
ES 450	Fieldwork in Comparative Ethnic Studies

Natural Resource Management and Environmental Sciences

ERSC/GEOG 250	Physical Geography
---------------	--------------------

ERSC 303	Soil Erosion and Water Conservation
ERSC/GEOG 325	Climate and Humanity
ERSC/GEOG 333	Human Impact on the Earth
ERSC/GEOL 402	Geologic Mapping
NR 215	Land and Resource Measurements
NR/LA 218	Introduction to Geographic Information Systems (GIS)
NR 260	Forest Practices and Environmental Protection
NR 306	Natural Resource Ecology and Habitat Management
NR 307	Fire Ecology
NR/ES 308	Fire and Society
NR 312	Technology of Wildland Fire Management
NR 314	Environmental Life-Cycle Analysis
NR 320	Watershed Processes and Management
NR 321	Water Systems Technology, Issues and Impacts
NR 323	Human Dimensions in Natural Resources Management
NR 326	Natural Resources Economics and Valuation
NR 335	Conflict Management in Natural Resources
NR 340	Wildland Fire Management
NR/CRP 404	Environmental Law
NR 408	Water Resource Law and Policy
NR/BIO/SS 421	Wetlands
SS 121	Introductory Soil Science
SS 321	Soil Morphology

Additional Electives

AG 350	The Global Environment
AG 360	Holistic Management
ANT 201	Cultural Anthropology
ANT 312	Introduction to Cultural Resources Management
ANT 320	California's Native Past
ANT 330	Indigenous South Americans
ANT 415	Native American Cultures
BIO 114	Plant Diversity and Ecology
BIO 227	Wildlife Conservation Biology
BIO 327	Wildlife Ecology
BIO 401	Principles of Conservation Biology
BOT 311	Plants, People and Civilization
ENGL 346	Ethnic American Literature
ENGL 380	Literary Themes
FSN 250	Food and Nutrition: Customs and Culture
GEOG 301	Geography of Resource Utilization
HIST 208	Survey of California History
ISLA 330	Cal Poly Land: Nature, Technology, and Society

LA 220	Landscape Ecology: Concepts, Issues and Interrelationships	
LA 330	Cultural Landscapes: People, Places and Ethical Decisions	
PHIL 340	Environmental Ethics	
POLS 325	Global Political Issues	
RPTA 302	Environmental and Wilderness Education	
RPTA 413	Tourism and Protected Area Management	
SPAN 351	Chicano/Latino Writers in the United States	
SOC 315	Global Race and Ethnic Relations	
SOC 316	American Ethnic Minorities	
Total units		27

¹ Consultation with the minor advisor is desirable and recommended in selecting classes. If any of these courses is taken to meet a major, support, or general education requirement in the degree, it cannot be double-counted as an approved elective.

MS Forestry Sciences

Program Learning Objectives

1. Technical competency in discipline
2. Effective communication skills
3. Awareness of impact of technology on society
4. Understanding ethics and professional conduct
5. Strong interpersonal and teamwork skills
6. Leadership/planning/decision making skills
7. Critical thinking/complex problem-solving skills

Required Courses

SS 501	Research Planning	4
NR 532	Applications in Biometrics and Econometrics	4
NR 581	Graduate Seminar in Environmental Sciences	3
NR 599	Thesis	9

Area of Emphasis

Determined by the student's graduate committee from forestry subdisciplines (400–500 level). 25

At least half of all units required by the committee as reflected on the formal study plan must be at the 500 level.

Total units	45
-------------	----

Wine and Viticulture

Agricultural Sciences Bldg. (11), Room 217

Phone: 805.756.7308; Fax: 805.756.1335

<http://wvit.calpoly.edu>

Department Head: Benoit Lecat

Academic Programs

Program name	Program type
Wine and Viticulture	BS

Professional positions within the grape and wine industry are multi-dimensional, where winemakers and winegrape-growers work together with wine marketing and sales personnel. To develop successful strategies, management teams need to understand all aspects of wine.

The WVIT major provides a unique interdisciplinary learning experience, combining a solid foundation in winegrape production, winemaking, and wine business with a concentration in enology, viticulture or wine business. With a campus located in the heart of California's Central Coast wine country, Cal Poly students have the added benefit of gaining hands-on experience at one of more than 400 local vineyards and wineries. The WVIT major is based on fundamental and applied sciences, modern agribusiness principles, and appropriate social sciences. The curriculum encompasses winegrape cultivation, enology, sensory science, and wine business and fosters an academic alliance among production agriculture, food -science, and agricultural business interests to provide an academic understanding of the "vine to glass" philosophy.

Cal Poly has a 14-acre campus vineyard and pilot winery that provide students the opportunity to practice our "learn-by-doing" method of education.

Undergraduate Program BS Wine and Viticulture

The major is based on fundamental and applied sciences, modern agribusiness principles, and appropriate social sciences. The curriculum encompasses winegrape cultivation, enology, and wine business and fosters an academic alliance among production agriculture, food science, and agricultural business interests to provide an academic understanding of the "vine to glass".

Concentrations

Enology

The science of winemaking and its creative and practical application. Students monitor and assess wines and winemaking choices using sensory, chemical and microbiological analyses. Graduates are able to make creative winemaking decisions, manage a winery and provide successful solutions to winemaking challenges.

Viticulture

Intensive training in all aspects of quality wine grape production. Students learn site evaluation and vine-yard development, disease and pest management, sustain-ability, and state-of-the-art cultural practices. Graduates typically become vineyard managers, pest control advisors, or vineyard owners.

Wine Business

Students learn financial management, principles of vineyard and winery operations, strategic planning, branded wine marketing, packaging, wine

consumer behavior, and government compliance. Graduates are prepared for a variety of wine industry careers, with many planning to operate vineyards or wineries of their own.

Graduate Program

Cal Poly offers a Master of Science degree in Agriculture in which students can choose a thesis topic in enology, viticulture or wine business. Please refer to the MS Agriculture (p. 64) section of the College of Agriculture, Food and Environmental Sciences.

BS Wine and Viticulture

Program Learning Objectives

1. An understanding of the fundamental principles of wine grape growing, winemaking, and wine business, both domestically and globally, with in-depth knowledge in a chosen sub-discipline (viticulture, enology, or wine business).
2. Development of the ability to think critically and creatively, analyze and interpret data, and make reasoned and informed decisions.
3. Development of effective leadership skills, and strong written and oral communication skills.
4. An understanding of legal and environmental issues, and sustainability principles, within the wine industry.
5. A high commitment and respect for cultural diversity.
6. Strong interpersonal skills and an ability to collaborate with other wine industry professionals.
7. Create the desire to engage in lifelong learning.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation section of this catalog, including:

- 60 units upper division
- GWR
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or concentration courses may be selected as credit/no credit.

MAJOR COURSES

WVIT 101	Orientation to Wine and Viticulture	1
WVIT 102	Global Wine and Viticulture	4
WVIT 202	Fundamentals of Enology	4
WVIT/AEPS 210	Viticultural Practices	2
WVIT 233	Basic Viticulture	4
WVIT 339	Internship Wine and Viticulture	4
WVIT 343	Branded Wine Marketing	4
WVIT 423	Wine Law and Compliance	4
WVIT 442	Sensory Evaluation of Wine	4
WVIT 463	Issues, Trends and Careers in the Wine Industry	2
AGB 214	Agribusiness Financial Accounting	4
BOT 121	General Botany (B2&B4) ¹	4
BRAE 340	Irrigation Water Management (Area F) ¹	4

BUS 384	Human Resources Management	4
or AGB 369	Agricultural Personnel Management	
CHEM 127	General Chemistry for Agriculture and Life Science I (B3&B4) ¹	4
ECON 222	Macroeconomics (D2) ¹	4
MATH 161	Calculus for the Life Sciences I (B1) ¹	4
or MATH 141	Calculus I	
or MATH 221	Calculus for Business and Economics	
SS 121	Introductory Soil Science	4
STAT 218	Applied Statistics for the Life Sciences (B1) ¹	4
Concentration courses (see below)		58-59
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		48
FREE ELECTIVES		
Free Electives		4-5
Total units		180

¹ Required in Major; also satisfies GE.

Concentrations (select one)

- Enology (p. 146)
- Viticulture (p. 147)
- Wine Business (p. 148)

General Education (GE) Requirements

- 72 units required, 24 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics (no additional units required)	
B1	Mathematics/Statistics (8 units in Major) ¹	0
B2	Life Science (4 units in Major) ¹	0
B3	Physical Science (4 units in Major) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy (4 units in Major) ¹	0
D3	Comparative Social Institutions	4

D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective (4 units in Major) ¹	0
Total units		48

¹ Required in Major; also satisfies GE.

Enology Concentration

CHEM 128	General Chemistry for Agriculture and Life Science II	4
CHEM 129	General Chemistry for Agriculture and Life Science III	4
CHEM 312	Survey of Organic Chemistry	5
CHEM 313	Survey of Biochemistry and Biotechnology	5
MCRO 221	Microbiology	4
WVIT/MCRO 301	Wine Microbiology	4
WVIT 365	Wine Analysis and Amelioration	4
WVIT 404	Winemaking I	4
WVIT 405	Winemaking II	4
WVIT 406	Winemaking III	4

Senior Project

Select from the following:		4
WVIT 464	Senior Project - Enology and Viticulture	
WVIT 465	Senior Project - Research Experience in Enology or Viticulture	

Approved electives ¹

Select from the following:		12
AEPS 313	Agricultural Entomology	
AEPS 321	Weed Biology and Management	
AEPS 421	Postharvest Technology of Horticultural Crops	
AGB 212	Agricultural Economics	
AGB 310	Agribusiness Credit and Finance	
AGB 323	Agribusiness Managerial Accounting	
BIO 111	General Biology	
BIO 161	Introduction to Cell and Molecular Biology	
BIO 303	Survey of Genetics	
BIO 435	Plant Physiology	
BOT/AEPS 323	Plant Pathology	
BRAE 348	Energy for a Sustainable Society	
CHEM 216	Organic Chemistry I	
CHEM 217	Organic Chemistry II	
CHEM 401	Advanced Undergraduate Research	
FSN 230	Elements of Food Processing	
FSN 342	Brewing Science	
FSN 346	Brewing Methods	
FSN 354	Packaging Function in Food Processing	

FSN 370	Food Plant Sanitation and Prerequisite Programs	
FSN 374	Food Laws and Regulations	
MCRO 342	Public Health Microbiology	
MCRO 421	Food Microbiology	
SPAN 101	Elementary Spanish I ²	
or FR 101	Elementary French I	
or GER 101	Elementary German I	
or ITAL 101	Elementary Italian I	
SPAN 102	Elementary Spanish II ²	
or FR 102	Elementary French II	
or GER 102	Elementary German II	
or ITAL 102	Elementary Italian II	
SPAN 103	Elementary Spanish III ²	
or FR 103	Elementary French III	
or GER 103	Elementary German III	
or ITAL 103	Elementary Italian III	
SPAN 201	Intermediate Spanish I ²	
or FR 201	Intermediate French I	
or GER 201	Intermediate German I	
or ITAL 201	Intermediate Italian I	
SPAN 202	Intermediate Spanish II ²	
or FR 202	Intermediate French II	
or GER 202	Intermediate German II	
SS 221	Soil Health and Plant Nutrition	
WVIT/AEPS 331	Advanced Viticulture - Fall	
WVIT 332	Advanced Viticulture - Winter	
WVIT 333	Advanced Viticulture - Spring	
WVIT 339	Internship Wine and Viticulture (limited to 2 units)	
WVIT 344	Direct to Consumer Wine Sales	
WVIT 400	Special Problems for Advanced Undergraduates	
WVIT/AEPS 414	Grape Pest Management	
WVIT 428	Winegrape Vineyard Management	
WVIT 433	Wine Sales and E-Commerce	
WVIT 444	Wine Marketing Research and Market Analysis	
WVIT 447	Logistics for the Global Wine Industry	
WVIT 450	Wine Business Strategies	
WVIT 460	Senior Project - Wine Business	
WVIT 470	Selected Advanced Topics	
WVIT 471	Selected Advanced Laboratory	
Total units		58

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² A maximum of 8 units of foreign language may be counted toward approved electives.

Viticulture Concentration

AEPS 313 Agricultural Entomology 4

AEPS 321	Weed Biology and Management	4
AEPS/BOT 323	Plant Pathology	4
CHEM 128	General Chemistry for Agriculture and Life Science II	4
CHEM 312	Survey of Organic Chemistry	5
SS 221	Soil Health and Plant Nutrition	4
WVIT 302	Wine Fermentation Laboratory	2-4
or WVIT 404	Winemaking I	
WVIT/AEPS 331	Advanced Viticulture - Fall	4
WVIT 332	Advanced Viticulture - Winter	4
WVIT 333	Advanced Viticulture - Spring	4
WVIT/AEPS 414	Grape Pest Management	4
WVIT 428	Winegrape Vineyard Management	4
Senior Project		
Select from the following:		4
WVIT 464	Senior Project - Enology and Viticulture	
WVIT 465	Senior Project - Research Experience in Enology or Viticulture	
Approved electives ¹		
Select from the following:		6-8
AEPS 120	Principles of Horticulture and Crop Science	
AEPS/AG 315	Organic Crop Production	
AEPS 327	Vertebrate Pest Management	
AEPS 355	Citrus and Avocado Fruit Production	
AEPS 406	Advanced Weed Management	
AEPS 431	Insect Pest Management	
AEPS 441	Biological Control for Pest Management	
AG/ASCI 360	Holistic Management	
AG 450	Applied Holistic Management	
AG 452	Issues Affecting California Agriculture	
AGB 212	Agricultural Economics	
AGB 310	Agribusiness Credit and Finance	
BIO 435	Plant Physiology	
BOT 326	Plant Ecology	
BRAE 438	Drip/Micro Irrigation	
CHEM 313	Survey of Biochemistry and Biotechnology	
FSN 342	Brewing Science	
FSN 346	Brewing Methods	
GEOG 318	Applications in GIS	
GEOG 328	Applications in Remote Sensing	
MCRO 221	Microbiology	
SPAN 101	Elementary Spanish I ²	
or FR 101	Elementary French I	
or GER 101	Elementary German I	
or ITAL 101	Elementary Italian I	
SPAN 102	Elementary Spanish II ²	
or FR 102	Elementary French II	
or GER 102	Elementary German II	

or ITAL 102	Elementary Italian II	
SPAN 103	Elementary Spanish III ²	
or FR 103	Elementary French III	
or GER 103	Elementary German III	
or ITAL 103	Elementary Italian III	
SPAN 201	Intermediate Spanish I ²	
or FR 201	Intermediate French I	
or GER 201	Intermediate German I	
or ITAL 201	Intermediate Italian I	
SPAN 202	Intermediate Spanish II ²	
or FR 202	Intermediate French II	
or GER 202	Intermediate German II	
SS 321	Soil Morphology	
SS 322	Soil Plant Relationships	
SS 440	Forest and Range Soils	
WVIT/MCRO 301	Wine Microbiology	
WVIT 339	Internship Wine and Viticulture (Limited to 2 units)	
WVIT 344	Direct to Consumer Wine Sales	
WVIT 365	Wine Analysis and Amelioration	
WVIT 400	Special Problems for Advanced Undergraduates	
WVIT 404	Winemaking I	
WVIT 405	Winemaking II	
WVIT 406	Winemaking III	
WVIT 433	Wine Sales and E-Commerce	
WVIT 444	Wine Marketing Research and Market Analysis	
WVIT 447	Logistics for the Global Wine Industry	
WVIT 450	Wine Business Strategies	
WVIT 460	Senior Project - Wine Business	
WVIT 470	Selected Advanced Topics	
WVIT 471	Selected Advanced Laboratory	
Total units		59

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² A maximum of 8 units of foreign language may be counted toward approved electives.

³ Only if course was not used to complete non-elective viticulture concentration requirements.

Wine Business Concentration

AGB 212	Agricultural Economics	4
AGB 310	Agribusiness Credit and Finance	4
AGB 323	Agribusiness Managerial Accounting	4
RPTA 320	Strategic Event Planning	4
WVIT 302	Wine Fermentation Laboratory	2-4
or WVIT 404	Winemaking I	
WVIT 344	Direct to Consumer Wine Sales	4
WVIT 433	Wine Sales and E-Commerce	4

WVIT 444	Wine Marketing Research and Market Analysis	4
WVIT 447	Logistics for the Global Wine Industry	4
WVIT 450	Wine Business Strategies	4
WVIT 460	Senior Project - Wine Business	4

Approved electives ¹

Select from the following: 15-17

AEPS 421	Postharvest Technology of Horticultural Crops	
AGB 260	Agribusiness Data Literacy	
AGB 311	Intermediate Agribusiness Finance	
AGB 312	Agricultural Policy	
AGB 324	Agricultural Property Management and Sales	
AGB 326	Rural Property Appraisal	
AGB 404	Food Retail Management	
AGB 452	Agricultural Market Structure and Strategy	
BRAE 348	Energy for a Sustainable Society	
BRAE 438	Drip/Micro Irrigation	
BUS 207	Legal Responsibilities of Business	
BUS 301	Global Financial Institutions and Markets	
BUS 302	International and Cross Cultural Management	
BUS 303	Introduction to International Business	
BUS 304	International Supply Chains	
BUS 310	Introduction to Entrepreneurship	
BUS 410	The Legal Environment of International Business	
FSN 230	Elements of Food Processing	
FSN 354	Packaging Function in Food Processing	
FSN 374	Food Laws and Regulations	
JOUR 203	News Reporting and Writing	
JOUR 285	Introduction to Multimedia Journalism	
JOUR 312	Public Relations	
JOUR 331	Contemporary Advertising	
JOUR 342	Public Relations Writing and Editing	
RPTA 114	Introduction to Hospitality and Travel	
RPTA 314	Sustainable Travel and Tourism Planning	
RPTA 412	Tourism and Outdoor Applications Seminar	
RPTA 420	Festival and Event Management	
SPAN 101	Elementary Spanish I ²	
or FR 101	Elementary French I	
or GER 101	Elementary German I	
or ITAL 101	Elementary Italian I	
SPAN 102	Elementary Spanish II ²	
or FR 102	Elementary French II	
or GER 102	Elementary German II	

or ITAL 102	Elementary Italian II	
SPAN 103	Elementary Spanish III ²	
or FR 103	Elementary French III	
or GER 103	Elementary German III	
or ITAL 103	Elementary Italian III	
SPAN 201	Intermediate Spanish I ²	
or FR 201	Intermediate French I	
or GER 201	Intermediate German I	
or ITAL 201	Intermediate Italian I	
SPAN 202	Intermediate Spanish II ²	
or FR 202	Intermediate French II	
or GER 202	Intermediate German II	
SS 221	Soil Health and Plant Nutrition	
WVIT/MCRO 301	Wine Microbiology	
WVIT/AEPS 331	Advanced Viticulture - Fall	
WVIT 332	Advanced Viticulture - Winter	
WVIT 333	Advanced Viticulture - Spring	
WVIT 339	Internship Wine and Viticulture (limited to 2 units)	
WVIT 365	Wine Analysis and Amelioration	
WVIT 400	Special Problems for Advanced Undergraduates	
WVIT 404	Winemaking I	
WVIT 405	Winemaking II	
WVIT 406	Winemaking III	
WVIT/AEPS 414	Grape Pest Management	
WVIT 428	Winegrape Vineyard Management	
WVIT 470	Selected Advanced Topics	
WVIT 471	Selected Advanced Laboratory	
Total units		59

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² A maximum of 8 units of foreign language may be counted toward approved electives.

College of Architecture and Environmental Design

Architecture and Environmental Design Bldg. (05), Room 212
Phone: 805.756.1321
<http://caed.calpoly.edu>

Dean: Christine Theodoropoulos
Associate Dean: Kevin Dong
Associate Dean: Mark Carbrinha

Academic Programs

Program name	Program type
Architectural Engineering	BS, Minor, MS
Architecture	BArch, MS
City and Regional Planning	BS, MCRP, Minor
Construction Management	BS, Minor
Landscape Architecture	BLA, Minor
Real Property Development	Minor
Sustainable Environments	Minor
Transportation Planning	MRCP/MS Engineering

The five undergraduate programs share the common objective of betterment of the human physical environment through the effective application of natural and cultural systems knowledge in planning, design and construction. They are all nationally accredited by their respective external review organizations.

The masters degree programs are designed for students interested in advanced focused studies. The MS Architecture program has a research focus. The college offers the Master of City and Regional Planning (MCRP). The joint MCRP/MS Engineering with a specialization in Transportation Planning is an interdisciplinary program. It is a cooperative effort between the colleges of Engineering and Architecture and Environmental Design. The MS in Architectural Engineering is a post professional degree aimed at advanced study in structural design analysis and construction trends. It is possible to blend this degree with the BS Architectural Engineering.

The well-equipped college facilities include design laboratories, grading presentation galleries, soils laboratory, stress laboratory, wood, metal and digital fabrication facilities, project yard, instructional resource center, computer laboratories, and photo presentation laboratory. An outlying area of 12 acres known as the "Canyon" is available for experimental construction.

The location of the campus between the population centers of San Francisco and Los Angeles is ideal for community and environmental studies in a variety of contexts and scales. Course field trips to varying destinations are offered in each of the majors. Students have the opportunity to participate in national and international exchange programs and faculty led off-campus academic and co-curricular experiences. Students also regularly participate in the California State University's International Programs in Denmark and Italy.

In addition to individual faculty representation in a wide range of professional associations, departments are members of their respective educators associations: the Association of Collegiate Schools of Architecture (ACSA); the Council of Educators in Landscape Architecture

(CELA); the Association of Collegiate Schools of Planning (ACSP); and the Associated Schools of Construction Management (ASCM).

Likewise, students maintain active chapters of the professional organizations of the American Institute of Architects (AIA), the American Society of Landscape Architects (ASLA), the Associated General Contractors (AGC), the Structural Engineers Association of California (SEAOC), the American Planning Association (APA), and the National Society of Architectural Engineers (NSAE), Construction Specifications Institute Student Club (CSI), the National Organization of Minority Architecture Students (NOMAS), Society of Women Engineers (SLWE).

Opportunities for interdisciplinary interaction within the college are made available through coursework, annual forums, participation in district and national student competitions, student council activities and community service projects. Students are exposed to viable economic and ecological alternatives to conventional planning, design and construction through faculty applied research in such areas as passive solar building, post-disaster community rebuilding, sustainable design and construction technologies, earthquake-resistant building systems, project delivery methodologies, and daylighting and electrical lighting integration.

The college has various enhanced computing capabilities including Geographic Information System Technology, Computer-Aided Design and Immersive Visualization (virtual reality).

Students interested in pursuing one of the five undergraduate program offerings within the college should familiarize themselves with the appropriate curriculum flow chart, available online and through the College Advising Center, Architecture and Environmental Design Bldg. (05), Room 221, and departments. Special attention is directed to the sequencing of courses and prerequisite requirements. Students who plan to transfer from a California community college should schedule classes to maximize transfer units. Current admission requirements may be found at the Cal Poly website (www.calpoly.edu).

As a consequence of the periodic review and accreditation requirements of its programs, the college reserves the right to keep selected student projects for its archives. These projects are returned to students at the discretion of their respective department faculty.

Additional information about the college and its programs may be found at its website, <http://caed.calpoly.edu>.

CAED Advising Center

Ellen Notermann, Director
Bldg. (05), Room 210
Phone: 805.756.1325
<http://www.caed.calpoly.edu/content/current/caed-advising>

The College of Architecture and Environmental Design (CAED) Advising Center provides academic advising services to all students within the CAED, in conjunction with each student's departmental faculty advisor. These services include providing information relative to curriculum requirements for all majors within the college, General Education requirements, transfer and evaluation credit and articulation, academic probation advising, University, College and department policies and procedures, change of major policies and procedures, tutoring, special academic programs, and referral of students to other campus resources.

The Advising Center processes most student-related forms including those for curriculum substitution, course withdrawal, change of major and other forms. Curriculum sheets, flowcharts, information on CAED

minors, jobs, scholarships and competitions are located in the Advising Center.

Interdisciplinary Minors

Real Property Development Minor

Construction Management Department (186), Room A100

Phone: 805.756.1323

Scott Kelting, Minor Advisor

skelting@calpoly.edu

This minor is designed for students who are interested in the built environment, and want to expand their knowledge of how projects get initiated, move through the development process, and then how they are managed after construction.

The program is designed to prepare students for entry-level employment with professionals engaged in real property development. Courses include aspects of practitioners' real world experiences and knowledge of state-of-the-art practices, techniques, and challenges.

Students learn about the economic, design, environmental, and regulatory factors that influence housing, office, industrial, and commercial projects. They gain a clearer understanding of how these factors impact green development, urban sprawl, place-making, and transit oriented development.

Sustainable Environments Minor

Landscape Architecture Department (34), Room 212

Phone: 805.756.2040

Joseph Ragsdale, Minor Advisor

jragdsal (jragdsal@calpoly.edu)@calpoly.edu (jragdsal@calpoly.edu)

This minor educates students within the University in the principles and various aspects of sustainable environmental design with global, regional and local perspectives and concepts. It provides students with the knowledge and abilities needed to integrate concerns for ecology, social equity and economics within the context of human and natural resource systems and the built environment.

Environmental Studies Minor

Students who complete the Environmental Studies Minor, coordinated through the College of Science and Mathematics (see the College of Science and Mathematics (p. 336) catalog section for additional information), are able to:

- Analyze, explain, and evaluate environmental issues from both scientific/technical and social/political/economic perspectives.
- Integrate and synthesize knowledge from multiple disciplines.
- Explain and apply the methodologies and approaches that different disciplines bring to bear on complex problems.
- Work productively and effectively with students from other disciplines and with other points of view.
- Confront real issues of contemporary significance; issues that affect them and their future.
- Gain employment or pursue further study that emphasizes interdisciplinary knowledge and skills.

The College of Architecture and Environmental Design offers the following course options as a part of this minor:

- EDES 406 Sustainable Environments
- CRP 336 Introduction to Environmental Decision Making
- CRP 404 Environmental Law

Real Property Development Minor

Required Courses

CRP 212	Introduction to Urban Planning	4
CM 232 or CRP 315	Evaluation of Cost Alternatives ¹ Fiscal and Project Feasibility	3-4
CRP 446 or CRP 442 or CRP 412	Development Review and Entitlement Housing and Planning Plan Implementation	4
CM 475	Real Property Development Principles	4

Approved Electives

Select from the following:		8-9
ARCH 445	Urban Design in Architecture	
ARCH 472	Housing Design Concepts	
BUS 342	Fundamentals of Corporate Finance	
BUS 409	Law of Real Property	
BUS 434	Real Estate Finance	
BUS 435	Real Estate Investment	
CM 102	Introduction to Construction Management ²	
CM 214	Residential Construction Management ²	
CM 313	Commercial Construction Management ²	
CM 413	Jobsite Construction Management ²	
CM 420	Service / Experiential Learning	
CM 421	Emerging Trends	
CM 422	Professional Preparation	
CM 423	Construction Materials / Assemblies	
CM 424	Construction Technology	
CM 425	Sustainability and Environment	
CM 426	International Construction Studies	
CM 450	Integrated Project, Design and Program Management ²	
CRP 336	Introduction to Environmental Planning ³	
CRP 420	Land Use Law ³	
CRP 430	Professional Planning Practice	
CRP 442	Housing and Planning	
CRP 458	Local Hazard Mitigation Planning and Design	
CRP 470	Selected Advanced Topics	
ECON 434	Urban Economics	
ECON 435	Economics of Land and Water	
LA 470	Selected Advanced Topics	

Total units

24

¹ If CM 232 is taken, then at least 4 units of approved electives at the 300-400 level must be completed to meet the minimum requirement of 12 units of upper-division coursework for the minor.

² CM 102, CM 214, CM 313, CM 413 and CM 450 do not count for Construction Management majors.

³ CRP 336 and CRP 420 do not count for City and Regional Planning majors.

Sustainable Environments Minor

Required Courses

EDES 406	Sustainable Environments	4
EDES 408	Implementing Sustainable Principles	4

Approved Electives

Select from the following: 16

At least 4 units must be upper division (300-400 level)		
AG 450	Applied Holistic Management	
ANT 201	Cultural Anthropology ¹	
ANT 360	Human Cultural Adaptations ²	
ARCH 445	Urban Design in Architecture	
ARCH 472	Housing Design Concepts	
BIO 112	Environmental Biology and Conservation	
BIO 227	Wildlife Conservation Biology	
BRAE 348	Energy for a Sustainable Society	
CRP 211	Cities: Form, Culture and Evolution ⁴	
CRP 212	Introduction to Urban Planning ⁴	
CRP 214	Land Use and Transportation Studies ⁴	
CRP/ES 215	Planning for and with Multiple Publics	
CRP 334	Cities in a Global World	
CRP 336	Introduction to Environmental Planning ⁴	
CRP 339	Disaster-Resistant Sustainable Communities	
CRP 342	Environmental Planning Methods ⁴	
CRP 436	Collaborative Planning ⁴	
CRP 438	Pollution Prevention and Control	
ECON/HNRS 303	Economics of Poverty, Discrimination and Immigration	
EDES 410	Advanced Implementation of Sustainable Principles	
ENGL 380	Literary Themes (Eco-Lit)	
ES/ARCH 326	Native American Architecture and Place	
ES 360	Ethnicity and the Land	
GEOG 150	Human Geography ¹	
GEOG/ERSC 325	Climate and Humanity	
GEOG/ERSC 333	Human Impact on the Earth	
ISLA 303/ HNRS 304	Values and Technology	
NR/LA 218	Introduction to Geographic Information Systems (GIS) ³	

NR 306	Natural Resource Ecology and Habitat Management ³
NR 320	Watershed Processes and Management
NR 321	Water Systems Technology, Issues and Impacts
NR 323	Human Dimensions in Natural Resources Management
NR/ES 360	Ethnicity and the Land
NR/CRP 404	Environmental Law
NR 414	Sustainable Forest Management
NR 434	Wood Properties, Products and Sustainable Uses
NR/HNRS 475	Sustainable Forest and Environmental Practices
PHIL 340	Environmental Ethics
PHYS 310	Physics of Energy
PSC 320	Energy, Society and the Environment
PSY 311	Environmental Psychology
SOC 313	Urban Sociology
UNIV/AG/ISLA 330	Cal Poly Land: Nature, Technology, and Society
UNIV 333	World Food Systems
UNIV 350	The Global Environment
UNIV 391	Appropriate Technology for the World's People: Development
UNIV 392	Appropriate Technology for the World's People: Design
UNIV 492	Appropriate Technology for the World's People: Design
Total units	24

¹ ANT 201 and GEOG 150 do not count for Sociology, Social Sciences, and Anthropology and Geography majors.

² ANT 360 does not count for Anthropology and Geography majors.

³ LA 218 / NR 218, and NR 306 do not count for Environmental Management and Protection majors.

⁴ CRP 211, CRP 212, CRP 214, CRP 336, CRP 342 and CRP 436 do not count for City and Regional Planning majors.

Architectural Engineering

Engineering West (21), Room 110

Phone: 805.756.1314

<https://arce.calpoly.edu>

Department Head: Allen C. Estes

Academic Programs

Program name	Program type
Architectural Engineering	BS, Minor, MS

The Architectural Engineering Department is an integral part of the College of Architecture and Environmental Design, and it shares and supports the mission of the College. The mission of the architectural engineering program is to educate students to be successful in the practice of structural engineering. The department has several overall program objectives, which are: to advance in a career path primarily in structural engineering or a building industry field, attain a graduate degree, engage in lifelong learning, and meet increasing professional demands to communicate effectively.

To eventually attain these overall program objectives, the following student learning outcomes must be satisfied. At the time of graduation, we expect our graduates to be able to: apply knowledge of mathematics, science and engineering to building structures; design and conduct experiments, as well as to analyze and interpret data; design a building system, component, or process to meet desired needs within realistic constraints such as regulatory, economic, environmental, social, political, ethical, health and safety, constructability, and sustainability; function in interdisciplinary teams for the design and construction of buildings; identify, formulate and solve structural engineering problems; understand professional and ethical responsibility; communicate effectively; have the broad education necessary to understand the impact of engineering solutions in a global and societal context; have a recognition of the need for and an ability to engage in life-long learning; have a knowledge of how the built environment is related to contemporary issues; use the techniques, skills and tools necessary for structural engineering practice; and apply construction and constructability issues in buildings. To attain these outcomes, the program provides a balance of theoretical (analytical) and experimental courses.

The Architectural Engineering program carefully addresses architectural design, constructability issues, life safety and economy of construction. In addition, course projects address realistic design criteria, such as economic implications and environmental, social, ethical and sustainability issues. Using integrated design projects, modern technological tools, and the latest design codes to address these goals, the department emphasizes the advantages of a close, interdisciplinary team-based approach to design and construction.

The use of interdisciplinary projects allows students to hone their communication, critical thinking, and project management skills by working in multi-disciplinary teams. As students learn more about building design, they become cognizant of the ethical implications of design, specifically of how political and societal issues affect the engineering of the built environment, both on a local scale and on a broader international scale. These larger societal issues motivate students to engage in life-long learning, allowing them to use their skills in professional structural engineering practice.

The department's learn-by-doing philosophy is part of a pedagogy which emphasizes design-centered laboratories, integrating theory and design, culminating in a senior project capstone design experience.

The Architectural Engineering Program is accredited by the Engineering Accreditation Commission of ABET (<http://www.abet.org>).

Undergraduate Programs

BS Architectural Engineering

Cal Poly's Department of Architectural Engineering's (ARCE) curriculum focuses on the structural engineering of buildings. By focusing on building design students are able to take many more structural engineering courses than is possible in a traditional civil engineering program. Beyond structural engineering courses, students take several architecture and construction management courses and studios, giving them an appreciation for these disciplines.

Architectural Engineering Minor

The minor is designed for students wishing to pursue a more in-depth education in structures. The coursework exposes students to analytical, design, and construction issues relevant to the structural design process. Students select a sequence of courses that focus on either structural design or structural analysis. The program is tailored for students majoring in architecture and construction management. Enrollment is limited and acceptance into the program is dependent upon the student's performance in structures-related courses. Contact the department for additional information.

Graduate Program

MS Architectural Engineering

New program, effective Fall 2017

The Master of Science in Architectural Engineering (MS Architectural Engineering) program is designed for students holding an accredited degree in architectural, civil or structural engineering. For students within the Cal Poly Architectural Engineering undergraduate program, a blended BS + MS option is available. The program is designed to prepare graduates to meet the demands for practice in the structural engineering profession. Core curriculum courses expose students to emerging topics in structures, advanced methodologies to predict and analyze structural behavior, and cutting edge design procedures. Additionally, related topics in architecture and building constructability are integrated into the curriculum to create a unique interdisciplinary masters level education. Elective courses also allow individuals to advance their knowledge in technical areas offered from graduate degree programs across the campus. Candidates should refer to the "General Policies Governing Graduate Studies (p. 412)" section for supplemental University requirements.

Blended BS Architectural Engineering + MS Architectural Engineering

For motivated students a blended BMS program, also referred to as a 4+1 program, is available. The blended program allows students to simultaneously complete both a bachelor's degree in Architectural Engineering and a master's degree in Architectural Engineering. The blended program offers promising individuals an opportunity to continue

their studies in architectural engineering in a collaborative learning environment.

Eligibility for the Blended Program

Architectural Engineering (ARCE) students wishing to pursue a Master of Science in Architectural Engineering degree may apply after completing all 300-level Architectural Engineering courses and 180 units. The ARCE Graduate Committee reviews all applications and selects individuals with records that demonstrate success at the undergraduate level as well as potential to succeed at the graduate level. Candidates shall meet the University requirements, as a minimum, stated in "Blended BS+MS Programs (<http://catalog.calpoly.edu/graduateeducation/#generalpoliciesgoverninggraduatestudies>)" in the Graduate Programs section. Contact the Architectural Engineering Department for additional information.

BS Architectural Engineering Program Learning Outcomes

1. An ability to apply knowledge of mathematics, science and engineering to building structures.
2. An ability to design and conduct experiments, as well as to analyze and interpret data.
3. An ability to design a building system, component, or process to meet desired needs within realistic constraints such as regulatory, economic, environmental, social, political, ethical, health and safety, constructability, and sustainability.
4. An ability to function in interdisciplinary teams for the design and construction of buildings.
5. An ability to identify, formulate and solve structural engineering problems.
6. An understanding of professional and ethical responsibility.
7. An ability to communicate effectively.
8. The broad education necessary to understand the impact of engineering solutions in a global and societal context.
9. A recognition of the need for and an ability to engage in life-long learning.
10. A knowledge of how the built environment relates to contemporary issues.
11. An ability to use the techniques, skills and tools necessary for structural engineering practice.
12. A basic proficiency in construction and constructability issues in buildings.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

All ARCE majors must obtain a grade of C- or better in ARCE courses that are prerequisites for other ARCE courses.

MAJOR COURSES

ARCE 106	Introduction to Building Systems	2
ARCE 211	Structures I	3
ARCE 212	Structures II	3
ARCE 223	Mechanics of Structural Members	3
ARCE 224	Mechanics of Structural Members Laboratory	1
ARCE 227	Structures III	2
ARCE 257	Structural CAD for Building Design	2
ARCE 302	Structural Analysis	3
ARCE 303	Steel Design I	3
ARCE 304	Timber Design	3
ARCE 305	Masonry Design	2
ARCE 306	Matrix Analysis of Structures	3
ARCE 352	Structural Computing Analysis	1
ARCE 353	Matrix Structural Computing Analysis	1
ARCE 354	Numerical Analysis Laboratory	1
ARCE 371	Structural Systems Laboratory	3
ARCE 372	Steel Structures Design Laboratory	3
ARCE 412	Dynamics of Framed Structures	3
ARCE 421	Soil Mechanics	3
ARCE 422	Foundation Design	3
ARCE 444	Reinforced Concrete Design	4
ARCE 451	Timber and Masonry Structures Design and Constructability Laboratory	3
ARCE 452	Concrete Structures Design and Constructability Laboratory	3
ARCE 476	Architectural Engineering Building Systems	3
ARCE 483	Seismic Analysis and Design	3
ME 212	Engineering Dynamics	3
Senior Project		
ARCE 415	Interdisciplinary Capstone Project	4
SUPPORT COURSES		
ARCH 131 & ARCH 132 & ARCH 133	Design and Visual Communication 1.1 and Design and Visual Communication 1.2 and Design and Visual Communication 1.3	12
ARCH 217 or ARCH 218 or ARCH 219 or ARCE 260	History of World Architecture: Prehistory - Middle Ages (C3) ¹ History of World Architecture: Middle Ages - 18th Century History of World Architecture: 18th Century - Present History of Structures	4
BRAE 237	Introduction to Engineering Surveying	2
CHEM 124	General Chemistry for Physical Science and Engineering I (B3/B4) ¹	4
CM 115	Fundamentals of Construction Management	6
CM 232	Evaluation of Cost Alternatives	3

or IME 314	Engineering Economics	
CSC 231	Programming for Engineering Students	2
EE 201	Electric Circuit Theory	3
GEOL 201	Physical Geology	3
MATH 141 & MATH 142	Calculus I and Calculus II (B1) ¹	8
MATH 143	Calculus III (Add'l Area B) ¹	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
ME 302	Thermodynamics I	3
ME 341	Fluid Mechanics I	3
PHYS 141	General Physics IA (Add'l Area B) ¹	4
PHYS 132 & PHYS 133	General Physics II and General Physics III	8
STAT 312	Statistical Methods for Engineers (B6) ¹	4
or STAT 321	Probability and Statistics for Engineers and Scientists	
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		44
FREE ELECTIVES		
Free Electives		0
Total units		196

¹ Required in Support; also satisfies GE.

General Education (GE) Requirements

- 72 units required, 28 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts (4 units in Support) ¹	0
C4	Upper-division elective	4
Area D/E	Society and the Individual	

D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		44

¹ Required in Support; also satisfies GE.

Architectural Engineering Minor

Required Courses

ARCE 211 & ARCE 212	Structures I and Structures II	6
ARCE 223	Mechanics of Structural Members	3
ARCE 226	Introduction to Structural Systems	3
ARCE 315	Introduction to Structural Design	4
ARCE 316 or ARCE 421	Structural Integration in Architecture or Soil Mechanics	3-4
Select either Analysis or Design Option:		8

Analysis Option

ARCE 227	Structures III	
ARCE 302	Structural Analysis	

Select one of the following:

ARCE 303	Steel Design I	
ARCE 304	Timber Design	

Design Option

ARCE 303	Steel Design I	
ARCE 304	Timber Design	
ARCE 305	Masonry Design	

Total units		27-28
-------------	--	-------

MS Architectural Engineering

Required Courses

ARCE 501	Advanced Structural Mechanics	3
ARCE 502	Nonlinear Structural Behavior I	3
ARCE 503	Nonlinear Structural Behavior II	3
ARCE 504	Finite Element Method for Building Structures	3
ARCE 511	Structural Systems Behavior	3
ARCH 551	Architectural Design (5, 5) ¹	10
Select from the following:		9
ARCE 598	Structural Engineering Design Project (3, 3, 3)	

or 9 units of approved elective courses in a student's Formal Study Plan and a comprehensive examination

Approved Electives

Electives	11
Total units	45

¹ 5 units of ARCH 551 may be replaced with 5 units of approved elective courses for students to collaborate with faculty on teaching-scholar research, to pursue electives focused on their masters project, or to broaden their masters coursework where appropriate.

Architecture

Architecture & Environmental Design Bldg. (05), Rm 212

Phone: 805.756.1316; Fax 805.756.1500

<https://architecture.calpoly.edu>

Department Head: Margot McDonald

Associate Department Head: Robert Arens

Academic Programs

Program name	Program type
Architecture	BArch, MS

The objective of the five-year Bachelor of Architecture degree program is to develop design and related skills necessary for entry into the professional field of architecture. Preparation for architecture spans several disciplines and requires a range of aptitudes. As the architect has a responsibility for solving problems of the built environment involving people, an understanding and sensitivity to human needs is required. Therefore, programs in architecture are broad in nature. With careful selection of elective work, focus areas can be included.

The Bachelor of Architecture degree is accredited by the National Architectural Accrediting Board.

Statement on NAAB Accredited Degrees

In the United States, most registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit professional degree programs in architecture offered by institutions with U.S. regional accreditation, recognizes three types of degrees: the Bachelor of Architecture (B.Arch), the Master of Architecture, and the Doctor of Architecture. A program may be granted an eight-year, three-year, or two-year term of accreditation, depending on the extent of its conformance with established educational standards.

Doctor of Architecture and Master of Architecture degree programs may require a preprofessional undergraduate degree in architecture for admission. However, the preprofessional degree is not, by itself, recognized as an accredited degree.

California Polytechnic State University, Architecture Department, offers the following NAAB-accredited degree program:

B.Arch. (225 undergraduate credits)

Next accreditation visit for program: 2017

Transfer Students

Transfer applicants into Architecture are ranked by Admissions in accordance to the formula outlined on the Admissions Web Site. The Architecture Department then invites the top ranked candidates to submit a portfolio of their work for final selection by the Architecture Department faculty.

Laptop Requirement

The department has a requirement that all freshmen or transfer students have a notebook computer when they enter the program. In the profession of architecture, computing is an integral component, and developing the ability to critically integrate hand and digital tools is a fundamental aspect of architectural education. A notebook

computer is the key to having computing capabilities available at all times and all locations. Financial aid may be available to cover the cost of the notebook computer (contact the Financial Aid Office (<http://financialaid.calpoly.edu>) for more information).

Off-Campus Architecture Programs

Off-campus study opportunities for fourth year Architecture students are offered in a variety of formats and locations. Programs from one quarter to a full year are available abroad and in the United States. There is a third year student general information session each fall quarter to present the department-sponsored programs offered for the following year. Applications from third year students for all programs are due in the winter quarter.

CSU International Programs

There are two CSU-sponsored organized studio programs for Architecture majors, one in Copenhagen, Denmark, and one in Florence, Italy. The concept of the studio organization is similar to Cal Poly. Credit for major design courses, some professional electives, some general education courses and free electives are handled through approved overseas study centers.

San Francisco Urban Design / LA Metro Programs

Two Urban Design/Internship Programs offer fourth year students the opportunity to live and study in San Francisco or Los Angeles for two quarters (winter and spring). Each class utilizes projects with the participation of talented, award-winning architectural offices and urban designers to introduce students to urban design and architectural practice.

Washington Alexandria Architecture Consortium

The Consortium, comprised of several universities including Cal Poly, is organized to offer a challenging and stimulating one-year option. The Center functions as an extension of the College of Architecture of Virginia Polytechnic Institute and State University (VPI) in the Washington DC Metropolitan Area. The Consortium seeks to explore and expand design pedagogues and processes and establish collaboration with national and international institutions.

Other Programs

The Architecture Department offers a changing variety of off-campus programs throughout the world. Contact the Architecture Department for current information.

Cooperative Education (Co-op)

In addition to traditional classroom study experiences and instructor-led field trips, students have the opportunity to work for professional architecture firms and receive professional elective credits. To find out more about Cooperative Education opportunities, visit the Architecture Department or Career Services. Applications and opportunities for Co-op credit are available year-round.

Undergraduate Program Bachelor of Architecture

The objective of the five-year Bachelor of Architecture degree program is to develop design and related skills necessary for entry into the professional field of architecture.

Graduate Program

Graduate Coordinator: Thomas Fowler

Master of Science in Architecture

The Master of Science in Architecture (MS ARCH) degree has a research focus that provides an opportunity for specialization. The MS ARCH Program prepares graduates for specialist and consultation positions in the broad field of Environmental Design within the Architecture, Engineering and Construction (AEC) industry. Graduates with a Bachelor of Architecture degree are welcomed to apply to focus on a post professional area of specialization. Graduates who hold a degree outside of architecture are also welcome to apply.

The MS ARCH Degree is not a professional degree in architecture. If you need more information on the educational requirements for licensure for the field of architecture see: NCARB.org (<http://www.ncarb.org>), NAAB.org (<http://naab.org/home>) and ACSA-arch.org (<http://www.acsa-arch.org>).

Curriculum Overview

The MS ARCH is a degree with a master’s research project (thesis or project) as the principal component. 45 total units are required for completion of the degree. A master’s proposal is prepared by each student, based upon their research interests formulated during the first year of the program.

Professional Practice Focus

Designed for applicants holding an accredited architecture degree wishing to pursue advanced studies with a strong professional practice orientation.

Environmental Design Focus

Designed for applicants holding a degree in one of the several cognate environmental design disciplines, engineering, or computer science, wishing to pursue advanced studies with a strong inter-professional orientation in the field of environmental design, with special reference to its three primary contributory disciplines of Architecture, City and Regional Planning, and Landscape Architecture. The common core curriculum aims to establish a central focus for advanced study and research, while sub-core studies and directed electives provide for in-depth study in one of the contributory disciplines of Architecture, City and Regional Planning, Architectural Engineering, Landscape Architecture and Construction Management.

Graduate Study Areas

Each of these areas listed below encompasses a wide range of potential study topics that may be selected for in-depth research subject to the interests and desires of the individual graduate student. However, regardless of the selected research topic students are expected to be knowledgeable of fundamental building science principles, and advanced information technology concepts. Graduate students are encouraged to build on the knowledge that they have gained from their previous academic studies and/or professional experience, as they acquire and contribute new knowledge in their chosen research specialization within one of the following broadly defined research areas.

- *Innovative Materials Practice:* This practice specialization focuses on design integration through innovations in materials and material assemblies enabled by contemporary modes of digital fabrication and their impact on design and the construction process. Associated with the Digital Fabrication Laboratory, physical prototyping and material testing are integrated into the course of study and research. In addition, sustainable practices in digital fabrication from material economies to cradle-to-cradle methodologies as well as responsive envelopes are of particular interest. This study area promotes interdisciplinary work as essential to innovation in design

and construction with connections to other disciplines including: Architectural Engineering, Construction Management, Material Engineering, and Mechanical Engineering. Study and research areas include but are not limited to: parametric design and fabrication of material systems, prefabrication, responsive envelopes, and material performance.

- *Sustainability and Resilient Design:* Study of the built environment as a low impact necessary enhancement of the natural environment in the service of humankind, including: renewable energy systems; waste recycling; energy conservation concepts and practices; self-contained biospheres; materials of construction and embodied energy considerations; green buildings; and, unhealthy building environment.

Bachelor of Architecture

Program Learning Objectives

1. Think critically and creatively about architectural problems.
2. Use a diverse range of communication skills including writing, speaking, drawing, and modeling to think about and convey architectural ideas.
3. Understand and apply the technical aspects of architecture, while considering the environmental impact of design decisions.
4. Synthesize a wide range of variables that contribute to an integrated design solution.
5. Understand the professional practice of architecture.
6. Understand architecture in relation to the larger world of knowledge.
7. Work productively with diverse groups including design professionals, clients, and users.
8. Use architectural knowledge and skills to make a positive contribution to society.
9. Make reasoned decisions based on an architectural understanding of ethics, diversity, and sustainability.
10. Engage in lifelong learning as a professional.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

ARCH 101	Survey of Architectural Education and Practice (1, 1, 1) ²	3
ARCH 131 & ARCH 132 & ARCH 133	Design and Visual Communication 1.1 and Design and Visual Communication 1.2 and Design and Visual Communication 1.3	12
ARCH 207	Architectural Technology Fundamentals 2.3	4

ARCH 217	History of World Architecture: Prehistory - Middle Ages (C3) ¹	4
ARCH 218	History of World Architecture: Middle Ages - 18th Century (Area C) ¹	4
ARCH 219	History of World Architecture: 18th Century - Present	4
ARCH 241 & ARCH 242	Architectural Technology Fundamentals 2.1 and Architectural Technology Fundamentals 2.2	8
ARCH 251 & ARCH 252 & ARCH 253	Architectural Design 2.1 and Architectural Design 2.2 and Architectural Design 2.3	15
ARCH 307	Architectural Systems Integration 3.2	4
ARCH 341 & ARCH 342	Architectural Systems Integration 3.1 and Architectural Systems Integration 3.3	8
ARCH 351 & ARCH 352 & ARCH 353	Architectural Design 3.1 and Architectural Design 3.2 and Architectural Design 3.3	15
ARCH 420	Seminar in Architectural History, Theory and Criticism	4
or ARCH 320	Topics in Architectural History	
ARCH 443	Issues in Contemporary Professional Practice	4
ARCH 451 & ARCH 452 & ARCH 453	Architectural Design 4.1 and Architectural Design 4.2 and Architectural Design 4.3	15
ARCH 481	Senior Architectural Design Project (5, 5, 5)	15
ARCH 492	Senior Design Thesis	3
SUPPORT COURSES		
ARCE 211	Structures I	3
ARCE 212	Structures II	3
ARCE 226	Introduction to Structural Systems	3
ARCE 315	Introduction to Structural Design	4
ARCE 316	Structural Integration in Architecture	4
EDES 123	Principles of Environmental Design (D4) ¹	4
MATH 141	Calculus I (B1) ¹	4
MATH 182	Calculus for Architecture and Construction Management (B1) ^{1,3}	4
PHYS 121	College Physics I (B3) ¹	4
or PHYS 141	General Physics IA	
PHYS 122	College Physics II (B3 & B4) ¹	4
or PHYS 132	General Physics II	
Professional Electives		18

May include: Any EDES, ARCH, ARCE, CM, CRP, LA or ART course. Any course included in any College of Architecture and Environmental Design minor, or the ART minor.

GENERAL EDUCATION (GE)

(See GE program requirements below.) 48

FREE ELECTIVES

Free Electives	0
Total units	225

¹ Required in Major/Support; also satisfies GE.

² Transfer students may substitute ARCH 400-02 for ARCH 101. Contact the department for details.

³ MATH 142 Calculus II substitutes for MATH 182.

General Education (GE) Requirements

- 72 units required, 24 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts (4 units in major) ¹	0
C4	Upper-division elective (no ARCH course, except ARCH 326)	4
Area C elective	(Choose one course from C1-C5) (4 units in major) ¹	0
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E) (4 units in Support) ¹	0
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		48

¹ Required in Major/Support; also satisfies GE.

Master of Science in Architecture

Required Courses

ARCH 551	Architectural Design (5, 5, 5)	15
ARCH 561	Advanced Design (3, 3, 3)	9
ARCH 598	Master's Design Project (3, 3, 3)	9

Directed Electives

Advisor approved elective courses are included in a student's formal program of study	12
Total units	45

City and Regional Planning

Architecture & Environmental Design Bldg. (05), Room 313

Phone: 805.756.1315

<https://planning.calpoly.edu>

Department Head: Michael Boswell

Academic Programs

Program name	Program type
City and Regional Planning	BS, Minor, Master of
Transportation Planning	MCRP/MS Engineering

The profession of city and regional planning involves helping people and communities manage growth and change in their physical, social, and economic environments. The focus is on understanding how cities and towns (human settlements) function and how to make them better places for people to live, work and play. City planning has its roots in engineering, architecture, landscape architecture, law, social welfare and government reform. The practice of city and regional planning is both science and art. It involves technical competence, creativity, hard-headed pragmatism and the ability to develop a vision of the future and to build on that vision. Contemporary planners combine design, quantitative, and people skills to assist communities and society. Both the undergraduate (BSCRCP) and the graduate (MCRP) programs are accredited by the national Planning Accreditation Board.

The degree programs prepare students for professional careers in the design of human settlements in harmony with the natural environment and the needs of society. Practicing planners work in public agencies, non-profit organizations, and private consulting firms, preparing comprehensive plans for projects, neighborhoods, cities, and entire regions. The plans address the use of land, housing, transportation, public facilities, and open space. In addition, they are responsible for finding the means to make their plans become a reality by budgeting for public projects and programs and by reviewing and regulating private development.

The curriculum leading to the Bachelor of Science in City and Regional Planning provides a broad, interdisciplinary education as well as competency in physical planning with an emphasis on urban design and development. The Master of City and Regional Planning degree builds on a general undergraduate preparation in the humanities, architecture, landscape architecture, social sciences or natural sciences, and offers four areas of excellence in research and teaching: Urban Design, Environment and Sustainability, Transportation and, Housing, Economic, and Community Development.

Undergraduate Programs

BS City and Regional Planning

The BSCRCP program cultivates creativity and problem solving in the management of urban change. Technical design and analytic skills for professional practice are taught utilizing field-based experiences.

The BSCRCP program is one of the most studio/lab intensive, four-year undergraduate planning degree in the United States. Beginning in year two and continuing through year four, students must take at least seven studio courses. In addition, students take the foundation courses necessary to be able to fulfill the studio expectations and learn from the studio experience. These foundation courses include urban design,

computer skill, planning theory, plan implementation methods and land use law.

The BSCRCP degree curriculum is a total of 180 quarter units, composed of three parts:

1. Required CRP major courses
2. Required Support courses; and
3. Required General Education courses

The Support courses are designed to provide core knowledge in the areas of ecology, natural science/geology, political science, and statistics. These skills provide the scientific, policy and analytical tools necessary for community planning.

All BSCRCP students are required to do an Internship. They must take an internship seminar course that contextualizes the practice experience and allow professional reflection.

In addition, all students prepare a "Senior Project" or they can meet this requirement by completing the Senior Project-Professional Practice studio.

City and Regional Planning Minor

The minor provides students with an interdisciplinary understanding of the science and the art of city planning and its relationship with other environmental design professionals. The student is provided with an understanding of how growth and change affect the physical, social and economic aspects of the city, including the relationships among land use, transportation, housing and the environment. Courses that build skills in the preparation of plan documents, land use studies and environmental studies are combined with laboratory courses providing opportunities for involvement in community building and plan-making projects.

The minor is excellent preparation for creating visions of the future, participation in government and community organizations. It enhances skills in disciplines that have linkages with cities and the built and natural environments. It provides the student with the knowledge, skills and values that help people build better communities and cities.

Additional Minors

The department also participates in offering interdisciplinary minors in Real Property Development, and Sustainable Environments. See the College of Architecture and Environmental Design (p. 150) page for further information.

Graduate Programs

Master of City and Regional Planning

General Characteristics

The Master of City and Regional Planning (MCRP) degree is an applied, comprehensive, and professionally-based program. It is open to students from any undergraduate major, with high standards of academic achievement who wish to pursue careers in city and regional planning. It is structured to prepare graduates to function in a general context of city planning. The core courses cover planning theory and history, methods, law, community-based studios, and formulation and implementation of plans and policies. In addition, skill building in all aspects of planning communications (visual, verbal, written) is stressed.

The program is six quarters (two years) in duration and consists of 72 approved units (not including courses necessary to compensate for deficiencies). Because of the sequencing of courses, students admitted to the program are generally expected to begin their studies in the fall quarter. Students with prerequisite coursework deficiencies and those with backgrounds allowing waivers of first-year core courses may be admitted in other quarters. The degree culminates in a thesis, professional project, or a community planning studio.

Students have an opportunity to develop a close working relationship with the planning faculty. Self-directed study, tailored to the student's interests and needs, is also encouraged.

Prerequisites

Students entering the MCRP program are required to have a basic working knowledge of word processing, spreadsheets and presentation software.

Applicants for admission to the Master of City and Regional Planning program are expected to:

- 1. Have earned a bachelor's degree from an accredited university or college.
- 2. Demonstrated academic excellence by earning at least a 3.0 (out of 4.0) grade point average in the last 90 quarter (60 semester) units of undergraduate work, and in cases of borderline grade point average, by earning qualifying scores on the Graduate Record Examination (GRE).
- 3. Show evidence of motivation, maturity, work ethic, academic excellence, and intellectual ability through references (3 letters required), work experience, and other life experiences.
- 4. Submit a representative example of a self-authored paper or project to demonstrate writing ability.
- 5. Demonstrate understanding of, and areas of interest in, city and regional planning from the perspective of their career and educational objectives, through the statement of purpose.

Applicants lacking prerequisites or other background requirements for classified standing requirements may be admitted on a conditionally classified basis, depending on the results of an individual analysis of their applications.

Joint MCRP/MS Engineering with Specialization in Transportation Planning

The MCRP/MS Engineering with Specialization in Transportation Planning (p. 406) is a joint interdisciplinary program between the College of Engineering and the City and Regional Planning Department of the College of Architecture and Environmental Design. Participation in the program requires enrollment in both Colleges. Participants successfully completing the program are awarded both the MCRP and the MS in Engineering, each with a Specialization in Transportation Planning.

MCRP, Architecture or Landscape Architecture Pathway

This pathway is available only to students who are enrolled in either Cal Poly's Bachelor of Architecture (BArch) program or Bachelor of Landscape Architecture (BLA) program. Students may request permission to enroll in Master of City and Regional Planning (MCRP) graduate level courses during their fourth and fifth years of study. Upon

completion of the BArch or BLA degree, students are eligible to formally apply for the MCRP program. Students who fulfill all the requirements first receive their bachelor's degree and then the MCRP. Contact the Graduate Coordinator, City and Regional Planning Department for additional information.

**BS City and Regional Planning
Program Learning Objectives**

After successfully completing the BSCR program, students will be able to:

Foundational skills

- 1. Demonstrate an understanding of the historical, theoretical, legal, and methodological foundations of planning
- 2. Effectively represent and communicate planning and urban design information

Methodology

- 1. Gather, organize, analyze and present planning information
- 2. Transform data and information into knowledge for action

Integrative skills

- 1. Integrate and apply the necessary skills and knowledge to address complex planning problems
- 2. Implement a planning process
- 3. Work with a variety of audiences: multiple publics, officials, and decision-makers

Professional skills

- 1. Reflect upon, critique, and evolve the practice of planning
- 2. Address issues of sustainability, diversity, and environmental and social justice
- 3. Practice in accordance with the AICP Code of Ethics

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

CRP 201	Basic Graphic Skills	4
CRP 202	Urban Design Studio I	4
CRP 203	Urban Design Studio II	4
CRP 204	Theories and Methods of Urban Design	3
CRP 211	Cities: Form, Culture and Evolution	4
CRP 212	Introduction to Urban Planning	4

CRP 213	Population, Housing and Economic Applications	4
CRP 214	Land Use and Transportation Studies	4
CRP 215	Planning for and with Multiple Publics (USCP)	4
CRP 216	Computer Applications for Planning	2
CRP 314	Planning Theory	4
CRP 315	Fiscal and Project Feasibility	4
CRP 336	Introduction to Environmental Planning	4
CRP 341	Urban Design Studio III	4
CRP 342	Environmental Planning Methods	4
CRP 409	Planning Internship	2
CRP 410	Community Planning Laboratory I	4
CRP 411	Community Planning Lab II	4
CRP 412	Plan Implementation	4
CRP 420	Land Use Law	4
CRP 430	Professional Planning Practice	3
CRP 457	GIS Applications in Planning	3
Select from the following:		4
CRP 461 & CRP 462	Senior Project I and Senior Project II (2, 2)	
CRP 463	Senior Project Professional Practice (4)	

Approved Electives ^{2, 3}

Select from the following:		15
AG/EDES/ENGR/ISLA/SCM/UNIV 350	The Global Environment ³	
ANT 360	Human Cultural Adaptations ³	
ARCH 445	Urban Design in Architecture	
ARCH 461	Advanced Computer-Aided Fabrication in Architecture	
BUS 382	Organizations, People, and Technology	
BUS 384	Human Resources Management	
BUS 477	Managing Change and Development	
CM 475	Real Property Development Principles	
CRP/PSY 304	Intergroup Dialogues	
CRP 334	Cities in a Global World	
CRP 338	Digital Cities ³	
CRP 400	Special Problems for Advanced Undergraduates	
CRP 402	Contemporary Urban Design	
CRP/NR 404	Environmental Law	
CRP/NR 408	Water Resource Law and Policy	
CRP 426	Planning Healthy Communities	
CRP 428	International Planning and Development	
CRP 435	Transportation Theory	
CRP 436	Collaborative Planning	
CRP 440	Climate Action Planning	
CRP 442	Housing and Planning	
CRP 445	Planning and Urban Ecology	

CRP 446	Development Review and Entitlement
CRP 448	Principles of Urban Design
CRP 452	Community Design Methods
CRP 456	Web Technologies for Planning
CRP 458	Local Hazard Mitigation Planning and Design
CRP 470	Selected Advanced Topics
CRP 471	Selected Advanced Laboratory
CRP 472	Planning Colloquium
CRP 483	Special Studies in City and Regional Planning
CRP 500	Individual Study
CRP 513	Planning Research and Analysis
CRP 516	Demographic and Analytic Tools
CRP 520	Feasibility Studies
CRP 525	Plan Implementation
CRP 545	Principles of Environmental Planning
ECON 303	Economics of Poverty, Discrimination and Immigration ³
ECON 325	Economics of Development and Growth
EDES 123	Principles of Environmental Design ³
EDES 406	Sustainable Environments
EDES 408	Implementing Sustainable Principles
EDES 410	Advanced Implementation of Sustainable Principles
ENGL 310	Corporate Communication
ENGL 317	Technical Editing
ENVE 323	Engineering for the Environment ³
ENVE 324	Introduction to Air Pollution ³
ERSC/GEORG 325	Climate and Humanity
ERSC/GEORG 333	Human Impact on the Earth
ERSC/GEORG 414	Global and Regional Climatology
GEORG 308	Global Geography ³
GEORG 318	Applications in GIS
JOUR 312	Public Relations
LA/NR 218	Applications in GIS
LA/NR 317	The World of Spatial Data and Geographic Information Technology ³
NR 306	Natural Resource Ecology and Habitat Management
NR 323	Human Dimensions in Natural Resources Management ³
NR 326	Natural Resources Economics and Valuation
NR 416	Environmental Impact Analysis and Management
NR 425	Applied Resource Analysis and Assessment
NR 435	Environmental Policy Analysis
NR 465	Ecosystem Management
NR 475	Sustainable Forest and Environmental Practices
PHIL 333	Political Philosophy ³

PHIL 334	Philosophy of Law ³
PHIL 335	Social Ethics ³
PHIL 336	Feminist Ethics, Gender, Sexuality and Society ³
PHIL 337	Business Ethics ³
PHIL 340	Environmental Ethics ³
PHIL 350	Aesthetics ³
POLS 310	The Politics of Race, Class, Gender and Sexuality
POLS 316	Political Participation
POLS 325	Global Political Issues ³
POLS/UNIV 333	World Food Systems ³
POLS 338	Critical Issues in American Politics ³
POLS 375	California Politics
POLS 419	Social Movements and Political Protest
POLS 451	Technology and Public Policy
POLS 459	The Politics of Poverty
POLS 471	Urban Politics
POLS 515	Public Policy
PSC 320	Energy, Society and the Environment ³
PSY 302	Behavior in Organizations
PSY 311	Environmental Psychology ³
PSY 350	Teamwork
PSY 352	Conflict Resolution: Violent and Nonviolent ³
RPTA 450	Resource and Grant Development
SOC 315	Global Race and Ethnic Relations ³
SOC 316	American Ethnic Minorities
SOC 323	Social Stratification
SOC 355	Quantitative Research Methods
SOC 395	Sociology of Complex Organizations
STAT 313	Applied Experimental Design and Regression Models ³
STAT 321	Probability and Statistics for Engineers and Scientists ³

SUPPORT COURSES

Select from the following:	4
BIO 112	Environmental Biology and Conservation
NR 306	Natural Resource Ecology and Habitat Management
Select from the following:	4
CHEM 110	World of Chemistry (B3 & B4) ¹
GEOL 102	Introduction to Geology (B3) ¹
GEOL 205	Earthquakes (B3) ¹
MATH 118	Precalculus Algebra (B1) ¹
Select from the following:	4
POLS 316	Political Participation
POLS 338	Critical Issues in American Politics
POLS 340	American Judicial Politics
POLS 341	American Constitutional Law
POLS 343	Civil Rights in America

POLS 349	Contemporary American Political Thought	
POLS 375	California Politics	
POLS 471	Urban Politics	
STAT 217	Introduction to Statistical Concepts and Methods (B1) ¹	4
or STAT 218	Applied Statistics for the Life Sciences	
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		60
FREE ELECTIVES		
Free Electives		0
Total units		180

¹ Required in Support; also satisfies GE.² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.³ If any of these courses is taken to meet a major, support, or general education requirement in the degree, it cannot be double-counted as an approved elective.

General Education (GE) Requirements

- 72 units required, 12 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective (no CRP course)	4
Area F	Technology	

F	Upper-division elective	4
Total units		60

¹ Required in Support; also satisfies GE.

City and Regional Planning Minor

Required Courses

CRP 212	Introduction to Urban Planning	4
---------	--------------------------------	---

Select from the following: 4

CRP 211	Cities: Form, Culture and Evolution	
---------	-------------------------------------	--

CRP 213	Population, Housing and Economic Applications	
---------	---	--

CRP 214	Land Use and Transportation Studies	
---------	-------------------------------------	--

Approved Electives

Select from the following: 19-20

CRP 215	Planning for and with Multiple Publics	
---------	--	--

CRP 314	Planning Theory	
---------	-----------------	--

CRP 325	Reflections on Biking, Walking and the City	
---------	---	--

CRP 334	Cities in a Global World	
---------	--------------------------	--

CRP 338	Digital Cities	
---------	----------------	--

CRP 402	Contemporary Urban Design	
---------	---------------------------	--

CRP 404	Environmental Law	
---------	-------------------	--

CRP 408	Water Resource Law and Policy	
---------	-------------------------------	--

CRP 412	Plan Implementation	
---------	---------------------	--

CRP 420	Land Use Law	
---------	--------------	--

CRP 426	Planning Healthy Communities	
---------	------------------------------	--

CRP 428	International Planning and Development	
---------	--	--

CRP 430	Professional Planning Practice	
---------	--------------------------------	--

CRP 435	Transportation Theory	
---------	-----------------------	--

CRP 440	Climate Action Planning	
---------	-------------------------	--

CRP 445	Planning and Urban Ecology	
---------	----------------------------	--

CRP 446	Development Review and Entitlement	
---------	------------------------------------	--

CRP 448	Principles of Urban Design	
---------	----------------------------	--

CRP 452	Community Design Methods	
---------	--------------------------	--

CRP 456	Web Technologies for Planning	
---------	-------------------------------	--

CRP 458	Local Hazard Mitigation Planning and Design	
---------	---	--

CRP 545	Principles of Environmental Planning	
---------	--------------------------------------	--

Total units 27-28

Master of City and Regional Planning Program Learning Objectives

After successfully completing the MCRP program, students will be able to:

Foundational skills

1. Demonstrate an understanding of the historical, theoretical, legal, and methodological foundations of planning
2. Effectively represent and communicate planning information

Methodology

1. Gather, organize, analyze and present planning information
2. Transform data and information into knowledge for action
3. Critically assess and apply scientific research

Integrative skills

1. Integrate and apply the necessary skills and knowledge to address complex planning problems
2. Develop and manage a planning process
3. Work with a variety of audiences: multiple publics, officials, and decision-makers

Professional skills

1. Reflect upon, critique, and evolve the practice of planning
2. Address issues of sustainability, diversity, and environmental and social justice
3. Practice in accordance with the AICP Code of Ethics

Required Courses

First Year

CRP 501	Foundations of Cities and Planning	4
---------	------------------------------------	---

CRP 504	Sustainable Communities	4
---------	-------------------------	---

CRP 510	Planning Theory	4
---------	-----------------	---

CRP 512	Introduction to Visual Communication and GIS	4
---------	--	---

CRP 513	Planning Research and Analysis	4
---------	--------------------------------	---

CRP 516	Demographic and Analytic Tools	4
---------	--------------------------------	---

CRP 525	Plan Implementation	4
---------	---------------------	---

CRP 553	Project Planning and Design Studio	4
---------	------------------------------------	---

Second Year

CRP 518	Policy Development	4
---------	--------------------	---

CRP 530	Planning Agency Management	4
---------	----------------------------	---

CRP 535	Land Use and Planning Law	4
---------	---------------------------	---

CRP 552	Community and Regional Planning Studio I	4
---------	--	---

CRP 554	Community and Regional Planning Studio II	4
---------	---	---

Select one of the following options: 4-6

CRP 556	Community and Regional Planning Studio III (4)	
---------	--	--

CRP 596	Professional Project (2, 2, 2)	
---------	--------------------------------	--

CRP 599	Thesis (2, 2, 2)	
---------	------------------	--

Select Advisor Approved Electives in one or combination of the following areas: 12

Specialty Areas (select one or combination)

Urban Design	
--------------	--

Environment and Sustainability	
--------------------------------	--

Transportation	
----------------	--

Housing, Economic, and Community Development	
--	--

Open Emphasis	
---------------	--

Advisor Approved Electives

Electives	2-4
-----------	-----

Total units 72

Construction Management

Building 186, Room A100

Phone: 805.756.1323

Department Head: Allan J. Hauck

<https://construction.calpoly.edu>

Academic Programs

Program name	Program type
Construction Management	BS, Minor

The professional constructor plays the central role in building and maintaining the infrastructure of this country and in markets around the world, making significant contributions throughout the planning, design, construction, and facilities management phases of major projects. The curriculum of the Construction Management program is specifically designed to prepare young men and women to fill this essential role. Building on a solid foundation in architecture, engineering, and business, the curriculum introduces students to construction methods and materials; to the techniques used to manage budgets, schedules, quality, and safety; to the varied contracting approaches used to deliver today's complex construction projects; and to the leadership and teamwork skills demanded by this profession. This curricular content is delivered in a unique, project-based environment that explores how these management principles are applied in each of the construction sectors, such as, commercial building, residential, heavy/civil, industrial, and specialty.

The mission of the department is to "provide innovative educational challenges focused on preparing construction professionals committed to excellence." To attain this mission and to support the interdisciplinary goals of the College of Architecture and Environmental Design, the department has established the following program goals:

The Cal Poly CM department will produce graduates who:

1. Demonstrate a readiness and ability to perform in the construction industry.
2. Demonstrate an ability to apply problem solving skills and integrate technical knowledge.
3. Demonstrate an ability to participate successfully within an interdisciplinary team environment.
4. Demonstrate an understanding of professional behavior, standards, and leadership attributes.
5. Demonstrate an ability to communicate effectively, both orally and written, and professionally present ideas.
6. Demonstrate a propensity for life long learning and service to the industry and community at large.

The Cal Poly CM faculty will:

1. Work closely with the architecture, engineering, and construction (AEC) industry and maintain currency and participation with industry practice.
2. Bring the AEC professions into the classroom and engage students in innovative learning experiences.
3. Engage in the scholarship of teaching, discovery, application, and integration.
4. Engage in life-long learning endeavors.

The Cal Poly CM administration will:

1. Secure, develop, and maintain professional relationships with the construction industry.

2. Create opportunities for faculty professional development.
3. Create a rich and challenging learning environment by providing the staff, faculty, space, equipment and supplies required.
4. Encourage and support innovative endeavors and approaches to teaching, learning, and the engagement of students.

Due to the department's close association with practitioners in the industry, many professional development opportunities are provided for our students. Over 200 companies per year recruit for internships, co-ops, and permanent job placements directly through the department. Through our Professional Advancement for Construction Students (PACS) program, students are systematically introduced to and encouraged to participate with the major associations and societies representing this industry. These opportunities include participation in the Associated Students of Construction Management (ASCM) club as well as student chapters of AGC, ABC, CMAA, DBIA, MCAA, NECA, Emerging Green Professionals, and Sigma Lambda Chi, the national honorary society for construction students. Extensive interaction with industry brings practicing professionals into the classroom and students out to the jobsites of projects throughout the region. Finally, student participation in regional and national project management competitions gives our students the opportunity to test their knowledge and management skills against teams of students from other universities.

For both first time Freshmen and transfer students from community colleges, the Construction Management faculty and staff are committed to providing the best education possible for the future generation of leaders in the construction profession. These future constructors are educated in modern, state-of-the-art facilities utilizing the technology typical of the companies for whom they will work. They benefit from a unique, interdisciplinary program that has been accredited by the American Council for Construction Education (ACCE) since 1978. The program at Cal Poly remains one of the largest and most respected Construction Management programs in the United States.

Transfer Students

Transfer students are welcome in the Construction Management program and should contact the department for advising help with efficiently scheduling their graduation requirements. Most lower division courses may be completed at most California Community Colleges. Full time students who have successfully completed these lower division courses prior to transferring into the department can usually anticipate graduating in six or seven quarters. Transfer students should work closely with their assigned advisors before registering for classes every quarter to ensure efficient progress to degree.

Laptop Requirement

The department has a requirement that all students have a laptop computer. Most Construction Management classes emphasize cooperative projects/assignments, and a laptop computer provides the required mobility to facilitate collaboration. In today's construction environment, computing is an integral component with the computer being the standard tool. A laptop computer is the key to having computing capability available at all times and all locations. Financial aid may be available to help cover the cost of the computer laptop (contact the Financial Aid Office (<http://financialaid.calpoly.edu>) for more information).

Undergraduate Programs

BS Construction Management

The Construction Management Department is the only one of its kind housed in a college that includes all of the other planning and design professions that define the built environment: Architecture, Architectural Engineering, Landscape Architecture, and City and Regional Planning.

Construction Management Minor

The Construction Management Minor provides students with an introduction to the body of knowledge expected of persons pursuing careers in the construction industry. This minor focuses on the materials, means and methods, which encompass the construction process. The Construction Management Minor will give students a competitive edge when applying for certain jobs in the built environment and is recommended for majors in architecture, architectural engineering, business, civil engineering, mechanical engineering, and electrical engineering. Contact the department for more information.

Minors

The department offers a Construction Management Minor for students in other programs and also participates in offering interdisciplinary minors in Real Property Development. Please see the College of Architecture and Environmental Design (p. 150) for more information.

BS Construction Management

Program Learning Objectives

1. Demonstrate a readiness and ability to perform in the construction industry.
2. Demonstrate an ability to apply problem solving skills and integrate technical knowledge.
3. Demonstrate an ability to participate successfully within an interdisciplinary team environment.
4. Demonstrate an understanding of professional behavior, ethical standards, and leadership attributes.
5. Demonstrate an ability to communicate effectively, both orally and written, and professionally present ideas.
6. Demonstrate a propensity for life long learning and service to the industry and community at large.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

CM 102	Introduction to Construction Management	2
--------	---	---

CM 113	Construction Materials and Assemblies	2
CM 114	Construction Materials and Assemblies Lab	2
CM 115	Fundamentals of Construction Management	6
CM 214	Residential Construction Management	5
CM 232	Evaluation of Cost Alternatives	3
CM 280	Building Information Modeling	2
CM 313	Commercial Construction Management	5
CM 314	Heavy Civil Construction Management	5
CM 317	Sustainability and the Built Environment (Area F) ¹	4
CM 334	Construction Law	2
CM 335	Construction Accounting	2
CM 411	Specialty Contracting Construction Management	5
CM 413	Jobsite Construction Management	5
CM 443	Management of the Construction Firm	3
CM 450	Integrated Project, Design and Program Management	5
CM 460	Senior Project Methodology	2
CM 461	Senior Project I	1
CM 462	Senior Project II	1
Technical Electives		
Select from the following:		8
CM 420	Service / Experiential Learning	
CM 421	Emerging Trends	
CM 422	Professional Preparation	
CM 423	Construction Materials / Assemblies	
CM 424	Construction Technology	
CM 425	Sustainability and Environment	
CM 426	International Construction Studies	
CM 485	Cooperative Education Experience (6 units maximum)	
SUPPORT COURSES		
Select from the following:		6
ARCE 211 & ARCE 212	Structures I and Structures II (3, 3)	
ME 211 & CE 204	Engineering Statics and Mechanics of Materials I (3, 3)	
ARCE 226	Introduction to Structural Systems	3
ARCE 315	Introduction to Structural Design	4
ARCE 421	Soil Mechanics	3
BRAE 239 or CM 239	Engineering Surveying Construction Surveying	4
BUS 207	Legal Responsibilities of Business	4
BUS 212	Financial Accounting for Nonbusiness Majors	4
BUS 215	Managerial Accounting	4

ECON 221	Microeconomics	4
ECON 222	Macroeconomics (D2) ¹	4
ECON 303	Economics of Poverty, Discrimination and Immigration (D5) (USCP) ¹	4
or ECON 304	Comparative Economic Systems	
EDES 123	Principles of Environmental Design (D4) ¹	4
ENGL 310	Corporate Communication (GWR)	4
GEOL 201	Physical Geology	3
MATH 141	Calculus I (B1) ¹	4
MATH 182	Calculus for Architecture and Construction Management ²	4
PHYS 141	General Physics IA	4
Select from the following:		4
PHYS 132	General Physics II (B3 & B4) ¹	
CHEM 124	General Chemistry for Physical Science and Engineering I (B3 & B4) ¹	
CHEM 127	General Chemistry for Agriculture and Life Science I (B3 & B4) ¹	
STAT 251	Statistical Inference for Management I (B1) ¹	4
or STAT 312	Statistical Methods for Engineers	
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		44
FREE ELECTIVES		
Free Electives		0
Total units		189

¹ Required in Major/Support; also satisfies GE.

² MATH 142 Calculus II substitutes for MATH 182.

General Education (GE) Requirements

- 72 units required, 28 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4

Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy (4 units in Support) ¹	0
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E) (4 units in Support) ¹	0
D5	Upper-division elective (4 units in Support) ¹	0
Area F	Technology	
F	Upper-division elective (4 units in Major) ¹	0
Total units		44

¹ Required in Major/Support; also satisfies GE.

Construction Management Minor

Required Courses

CM 102	Introduction to Construction Management	2
CM 113	Construction Materials and Assemblies	2
CM 114	Construction Materials and Assemblies Lab	2
CM 115	Fundamentals of Construction Management ¹	4-6
or CM 371	Construction Management and Project Planning	
CM 310	Construction Means and Methods	4
Select from the following (at least 4 units must be at the 300-400 level): ²		10
CM 232	Evaluation of Cost Alternatives	
CM 280	Building Information Modeling	
CM 317	Sustainability and the Built Environment	
CM 334	Construction Law	
CM 335	Construction Accounting	
CM 420	Service / Experiential Learning ²	
CM 421	Emerging Trends ²	
CM 422	Professional Preparation ²	
CM 423	Construction Materials / Assemblies ²	
CM 424	Construction Technology ²	
CM 425	Sustainability and Environment ²	
CM 426	International Construction Studies ²	
CM 485	Cooperative Education Experience (3 units maximum)	
Total units		24-26

¹ Students who complete this requirement with CM 115 need to take at least 9 units of 300-400 level courses in electives.

² Course availability varies from quarter to quarter.

Landscape Architecture

Dexter Bldg.(34), Room 251
Phone: 805.756.1319
<https://landscape.calpoly.edu>

Department Chair: Omar Faruque

Academic Program

Program name	Program type
Landscape Architecture	BLA, Minor

The profession of landscape architecture is primarily involved with the design, planning, and protection of the natural and developed environments. The five-year program in landscape architecture is accredited by the Landscape Architectural Accreditation Board and recognized by the Landscape Architects Technical Committee of the California Board of Architectural Examiners.

An emphasis is placed on a process oriented approach to design and planning while developing an awareness and sensitivity to community and human values as they relate to environmental conditions. Students majoring in landscape architecture acquire technical competencies and creative design skills through a range of projects which represent the breadth of the profession.

Graduates of the program are prepared for positions in private practice, consulting, governmental agencies at the national, state or local levels, industry and construction firms. Graduate study is encouraged for those students interested in pursuing advanced studies or academic positions.

Majors who are in their last two years of study and have at least a 3.2 grade point average may have the opportunity to join Theta Chapter of Sigma Lambda Alpha, the national scholastic honor society for landscape architecture.

Laptop Requirement

The department has a requirement that all freshmen or transfer students have a notebook computer when they enter the program. In the profession of landscape architecture, computing is an integral component, and developing the ability to critically integrate hand and digital tools is a fundamental aspect of landscape architecture education. A notebook computer is the key to having computing capabilities available at all times and all locations. Financial aid may be available to cover the cost of the notebook computer (contact the Financial Aid Office (<http://financialaid.calpoly.edu>) for more information).

Undergraduate Program

Bachelor of Landscape Architecture

The five-year program in landscape architecture is accredited by the Landscape Architectural Accreditation Board and recognized by the Landscape Architects Technical Committee of the California Board of Architectural Examiners. The program offers transfer students an accelerated curriculum to speed their time to graduation while fulfilling degree requirements. Contact the department for more information.

Landscape Architecture Minor

This minor is designed for students who want to expand their knowledge of the role landscape architecture plays in the planning,

conceptualization, and design of the natural and built environment. The program is structured to expose students to issues facing our society on global and local levels while reinforcing concepts of sustainability. From the perspective of landscape architecture, students will have the opportunity to either explore a variety of environmental issues or examine a specific topic area in greater depth. They will gain a clearer understanding of the interdisciplinary contributions, and leadership role that landscape architects take in addressing societal and environmental concerns.

Bachelor of Landscape Architecture

Program Learning Objectives

1. Integrate natural and cultural systems in projects at multiple scales.
2. Incorporate sustainable practices throughout the design, planning and implementation process.
3. Comprehend and demonstrate the relationships among analysis, concept development, design development, and implementation.
4. Apply critical thinking and analytical problem solving throughout planning, design and implementation.
5. Demonstrate knowledge of theory, history and contemporary practices of landscape architecture.
6. Apply professional communication skills including written, oral, graphic and digital formats.
7. Identify the role of landscape architects in professional interdisciplinary settings.
8. Apply technical skills in site engineering, material explorations and detailing, construction documents, plant materials, and planting design.
9. Apply professional standards, ethics and practices in the field of landscape architecture.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

LA 101	Introduction to Landscape Architecture	4
LA 170	Principles of Design Communication	4
LA 171	Principles of Digital Communication	4
LA 202	Design Fundamentals I	4
LA 203	Design Fundamentals II	4
LA 204	Design Fundamentals III	4
LA 211	History of Landscape Architecture: Ancient Civilizations through Colonial America (C3) ¹	4

LA 212	History of Modern and Contemporary Landscape Architecture (Area C elective) ¹	4
LA 220	Landscape Ecology: Concepts, Issues and Interrelationships	4
LA 221	California Plants and Plant Communities	4
or AEPS 381	Native Plants for California Landscapes	
LA 241	Site Engineering Techniques and Applications	4
LA 242	Implementation Strategies	4
LA 243	Materials and Techniques of Landscape Construction	4
LA 320	Design Theory for Landscape Architects	4
LA 330	Cultural Landscapes: People, Places and Ethical Decisions	4
LA 349	Advanced Planting Design	4
LA 370	Professional Practice	4
LA 371	Internship	3
LA 401	Research Project	2
LA 402	Design Theory and Exploration Focus Studio	4
LA 403	Natural Environments Design Focus Studio	4
LA 404	Cultural Environments Design Focus Studio	4
LA 405	Project Design and Implementation Focus Studio	4
Select from the following:		4
LA 402	Design Theory and Exploration Focus Studio	
LA 403	Natural Environments Design Focus Studio	
LA 404	Cultural Environments Design Focus Studio	
LA 405	Project Design and Implementation Focus Studio	
Integrated Learning Course (ILC) topics		
Select from the following: ²		20
LA 431	CAD and Digital Media Communications (ILC)	
LA 432	Landscape Ecology Applications (ILC)	
LA 433	Cultural Environments (ILC)	
LA 434	Project Design and Implementation (ILC)	
LA 435	Professional Practice (ILC)	
LA 436	Traditional and Digital Media Communications (ILC)	
LA 437	3D Digital Design Communications (ILC)	
LA 438	GIS Application to Design Projects (ILC)	
LA 439	Planting Design (ILC)	

LA 461	Senior Design Project Focus Studio (4,4)	8
Upper Division LA Electives ³		6
SUPPORT COURSES		
AEPS 233	Plant Materials I	4
AEPS 234	Plant Materials II	4
BOT 121	General Botany (B2&B4) ¹	4
or BIO 114	Plant Diversity and Ecology	
CRP 212	Introduction to Urban Planning	4
EDES 123	Principles of Environmental Design (D4) ^{1,4}	4
MATH 118	Precalculus Algebra (B1) ¹	4
MATH 119	Precalculus Trigonometry (B1) ¹	4
Select from the following:		8
BIO 227	Wildlife Conservation Biology	
BRAE 337	Landscape Irrigation	
SS 121	Introductory Soil Science	
STAT 217	Introduction to Statistical Concepts and Methods	
or STAT 218	Applied Statistics for the Life Sciences	
Professional Electives: ⁵		8
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		48
FREE ELECTIVES		
Free Electives		0
Total units		219

¹ Required in Major or Support; also satisfies GE.

² At least three (3) different Integrated Learning Courses must be chosen. (ILCs are repeatable to 12 units).

³ 300 or 400-level LA courses and/or EDES 333.

⁴ May substitute 4 units of any GE D4 course.

⁵ May include any course in: College of Architecture and Environmental Design; Art and Design Department; TH 330; any minor in the College of Architecture and Environmental Design.

General Education (GE) Requirements

- 72 units required, 24 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	

C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts (4 units in Major) ¹	0
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5) (4 units in Major) ¹	0
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E) (4 units in Support) ¹	0
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		48

¹ Required in Major or Support; also satisfies GE.

Landscape Architecture Minor

Required Courses

LA 101	Introduction to Landscape Architecture	4
LA 212	History of Modern and Contemporary Landscape Architecture	4
LA 220	Landscape Ecology: Concepts, Issues and Interrelationships	4
LA 330	Cultural Landscapes: People, Places and Ethical Decisions	4

Approved Electives ¹

Select from the following: 12

AEPS 381	Native Plants for California Landscapes
AEPS 437	Park and Public Space Management
ARCH 445	Urban Design in Architecture
BRAE 337	Landscape Irrigation
BRAE 345	Aerial Photogrammetry and Remote Sensing
CRP 438	Pollution Prevention and Control
EDES 350	The Global Environment
EDES 406	Sustainable Environments
LA 320	Design Theory for Landscape Architects
LA 370	Professional Practice
LA 400	Special Problems for Advanced Undergraduates
LA 432	Landscape Ecology Applications (ILC)
LA 433	Cultural Environments (ILC)
LA 435	Professional Practice (ILC)
NR 306	Natural Resource Ecology and Habitat Management

NR 323	Human Dimensions in Natural Resources Management
NR/CRP 408	Water Resource Law and Policy
Total units	28

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Orfalea College of Business

Business Bldg. (03), Room 455
Phone: 805.756.2705
<http://cob.calpoly.edu>

Dean: Scott Dawson
Associate Dean: Kevin Lertwachara
Associate Dean: Jean-Francois Coget
Associate Dean: Sanjiv Jaggia
Assistant Dean: Amy Carter
Assistant Dean, Advancement: Mary Kelting
Director, Development: Alyssa Graudins

Academic Programs

Program name	Program type
Accounting	Minor, MS
Business Administration	BS, MBA
Business Analytics	MS
Economics	BS, Minor
Engineering Management	MBA, MS
Entrepreneurship	Minor
Industrial Technology	Minor
Industrial Technology and Packaging	BS
Integrated Marketing Communications	Minor
Packaging	Minor
Packaging Value Chain	MS
Quantitative Economics	MS
Taxation	MS

Mission Statement

We prepare career-ready, global business leaders through hands-on discovery and application.

The BS degree program and the graduate programs in Business Administration are accredited by the AACSB—The International Association to Advance Collegiate Schools of Business. The BS degree program in Industrial Technology and Packaging is accredited by the Association of Technology, Management, and Applied Engineering (ATMAE). The objective of accreditation is to foster high quality educational programs.

The college's educational philosophy follows the Cal Poly tradition—that of enlisting maximum student involvement in the learning process through case analysis, special projects, internships, computer simulations and other learn by doing exercises. The college has state-of-the-art computer facilities which are available to students to meet their coursework needs. Educational programs are designed to challenge highly motivated students to become tomorrow's socially responsible business leaders through a learn-by- doing technology oriented education. The curricula include general education requirements and specialized studies in the student's major field. Optional areas of concentration within each major enable the student to select the program most closely suited to the chosen career field.

The college is organized into six areas:

- Accounting and Business Law
- Economics

- Finance
- Industrial Technology and Packaging
- Marketing
- Management, Human Resources, and Information Systems

This organizational structure allows for programs of study that blend broad-based knowledge of the functional disciplines of Business and Economics with an in-depth study of particular discipline(s).

Accounting and Business Law

Business Bldg. (03), Room 403
Phone: 805.756.1543

Area Chair: Doug Cerf

Accounting provides information for making informed business decisions by decision makers both external and internal to the firm. The Accounting and Business Law Area works closely with the accounting profession to help ensure curriculum relevancy and technical competency.

The accounting program offers a Master of Science (see Graduate Programs (p. 175)). The Master of Science along with the Accounting concentration or minor allows the student to meet the academic requirements for licensure as a Certified Public Accountant (CPA).

Economics Area

Business Bldg. (03), Room 407
Phone: 805.756.2783

Area Chair: Aric Shafran

The mission of the economics program is to educate students in the models and problem solving tools of economics. The Economics Area offers a bachelor of science degree, a master of science degree, and a minor in Economics.

Finance Area

Business Bldg. (03), Room 407
Phone: 805.756.1472

Area Chair: John Dobson

The Finance Area offers the Financial Management (FM) concentration which provides a rigorous, coherent, real-world-based, and up-to-date curriculum to prepare students for rewarding careers. The FM students gain in-depth knowledge of Fixed Income Securities (Bond Markets), Security Analysis and Portfolio Management (Equity and Derivative Markets), Corporate Finance (Mergers and Acquisitions and Initial Public Offerings), Alternative Investments (Foreign Exchange, Commodities and Real Estate), and Quantitative Methods.

Finance classes are taught in the **Financial Analysis Resource Center**, a special-purpose classroom with data terminals, and real time display of stock prices. The computers are equipped with financial data and software, which permits students to work on real-world problems - individually and in teams.

Finance students have outstanding internship and senior project opportunities, including the ability to pursue the Chartered Financial Analyst (CFA) designation; the ability to participate in the Student Managed Portfolio Project, where they assume an active role in investing Cal Poly Corporation endowment funds; and the opportunity to intern with major corporations, investment banks, and money management firms. Our graduates pursue careers in Financial Services, Corporate Finance,

and as Financial Analysts, working for investment banks, brokerage firms, the asset management industry, the real estate industry, consulting firms, and other facets of business.

Industrial Technology Area

Business Bldg. (03), Room 405
Phone: 805.756.2676

Area Chair: Eric Olsen

The Industrial Technology Area offers a bachelor of science degree in Industrial Technology and Packaging, with concentrations in Industrial Technology, and Packaging, and minors in Industrial Technology and in Packaging. IT is also the administrative home for the interdisciplinary Entrepreneurship concentration and minor, and the Consumer Packaging Solutions concentration.

Management, Human Resources, and Information Systems Area

Business Bldg. (03), Room 405
Phone: 805.756.2012

Area Chair: Leida Chen

The Management, Human Resources, and Information Systems Area's goals are fourfold:

1. to provide students with management theories, strategies, and practices essential for understanding how modern organizations operate and succeed in a complex and global environment,
2. to introduce students to the information technologies that enable the success of critical business processes and enhance worker creativity and productivity,
3. to engage students in learning about team dynamics and team leadership, and
4. to prepare our graduates, through a focus on experiential learning, for rewarding careers in a myriad of industries.

The Management, Human Resources, and Information Systems Area offers all business students coursework in organizational behavior, information systems, international management, and business strategy. We offer concentration specific courses in both of the concentrations that are housed in the Management, Human Resources, and Information Systems Area: (1) Management and Human Resources, and (2) Information Systems.

Marketing Area

Business Bldg. (03), Room 403
Phone: 805.756.1543

Area Chair: Stern Neill

The Marketing Area offers the Marketing Management concentration which cultivates agile marketers, who integrate data analytics, critical thinking and creativity. The curriculum is a conscious balance among the technical rigors of data, the nuance of creative strategy, and the finesse of customer relationship management. Students engage in hands-on projects that provide experience and confidence. From market research to communications strategies, students have opportunities to provide data-driven guidance and creative solutions to local startups, Cal Poly organizations, and the community.

As a discipline with broad applications, the Marketing Management concentration offers flexible career paths and work styles. Graduates are in demand for positions in market research and analytics; business development and sales; and marketing communications, advertising, digital and product marketing.

Orfalea Student Services

Business Bldg. (03), Room 100
Phone: 805.756.2601
www.cob.calpoly.edu/studentservices

Mission Statement

Orfalea Student Services empowers future global business leaders to forge their unique path to success. We cultivate a dynamic and inclusive environment that supports student needs through advising, mentoring, and connection to industry. We deliver comprehensive programming that encourages exploration, leadership, and exposure beyond the classroom, resulting in career ready graduates who add value to their communities and industry.

Services Provided

- Professional Advisors that provide advising and counseling addressing areas of personal, academic, and career success
- Peer Advisors that provide assistance with progress to degree, study abroad, change of major and other administrative issues
- Peer Tutors
- Peer, Young Alumni, and Executive Mentors
- Career readiness programs and initiatives, including career coaching, and connection with employers and industry
- BUS 100 (Student Orientation & College Success)
- Enrollment management
- Student scholarships and grants
- Orfalea OutREACH, a Faculty & Staff student referral system
- Diversity & Inclusivity initiatives, including the Multicultural Business Program
- Ambassadors, who provide prospective student and executive tours
- International student support
- Quarterly workshops, events and programs focused on student success

Transfer Students

Transfer students to the Orfalea College of Business should refer to the curricula listed for the appropriate major. Please note that all lower division courses may be completed at most California Community Colleges. Full time students who have successfully completed all lower division courses prior to transferring to the College of Business can usually anticipate graduating in six quarters. Admitted transfer students should seek immediate advising assistance from Orfalea Student Services.

BS Business Administration

The undergraduate business program provides students with the knowledge and the analytical skills essential for employment in all sectors of business, industry, governmental and non-profit organizations. Graduates of the business program will understand the fundamentals of how a successful enterprise operates, and will have sufficient depth in an area of study to begin a successful career by providing immediate value to an organization.

The Orfalea College of Business engages in a comprehensive assessment plan to ensure student achievement of these objectives.

The Business Administration degree program consists of five components: Major, Concentration, Support, General Education, and Electives.

Concentrations

Students may choose from the following concentrations:

- Accounting Concentration
- Consumer Packaging Concentration
- Entrepreneurship Concentration
- Financial Management Concentration
- Information Systems Concentration
- Management and Human Resources Concentration
- Marketing Management Concentration
- Real Estate Finance Concentration
- Quantitative Analysis Concentration

BS Economics

Economics is the study of how people choose to use resources.

Economics is a way of thinking, and students can apply this way of thinking to nearly any aspect of the world. The undergraduate curriculum in economics is designed to:

- provide a firm grounding in modern economic theory;
- instill the capacity for independent thought about economic policies and problems;
- develop the capacity for quantitative research, and
- provide basic descriptive knowledge about the US and the world economy.

An undergraduate major in economics opens many possibilities for employment. Many large firms, including banks, other financial institutions, and manufacturing companies, accept economists in substantial numbers. There are also many opportunities for employment in government at the state, federal, or international levels. In addition, a growing number of research and consulting firms employ large numbers of economists in such areas as forecasting, industry analysis, and litigation.

An undergraduate economics training also provides excellent preparation for business school, the study of law, or for pursuing doctoral studies in economics, business and public policy.

Concentrations

Students may elect to complete curriculum in General Economics or choose from the following concentrations:

- Accounting Concentration
- Consumer Packaging Concentration
- Entrepreneurship Concentration
- Financial Management Concentration
- Information Systems Concentration
- Management and Human Resources Concentration
- Marketing Management Concentration
- Real Estate Finance Concentration

- Quantitative Analysis Concentration

BS Industrial Technology and Packaging

The Industrial Technology and Packaging program incorporates a broad range of technical skills and business management to prepare individuals for positions in technology management or as entrepreneurs. The curriculum is particularly suited for careers that involve working with people and technology. The collaborative, project-based classes/laboratories create well-rounded, problem solving graduates that would be successful and quickly functional in a variety of industries including manufacturing and packaging. Students develop a strong foundation in science, liberal arts, business and management disciplines; a technical core including industrial power systems, materials and processes, quality management, lean six sigma, safety management, packaging, and product development. The curriculum includes extensive hands-on coursework in two concentrations: Industrial Technology, and Packaging. The IT concentration offers courses pertinent to general operations management, supply chain management and lean processes, while the Packaging concentration offers specialized courses in design and testing of packaging products and systems.

Concentrations

- Industrial Technology Concentration
- Packaging Concentration

Accounting Minor

The minor is designed to provide students from other majors a basic foundation in accounting. Upon successful completion of the minor, students will have coursework that can be applied towards the requirements for licensure as a Certified Public Accountant in California and most other states. Students wishing to pursue such licensure are encouraged to pursue a Master of Science in Accounting (specializing in either financial accounting or taxation) upon completion of their undergraduate education.

Students applying to the minor must be at sophomore level standing with a minimum GPA of 3.0. Acceptance into the Accounting minor is not guaranteed and capacity is limited. The Accounting Area will select only the most qualified applicants with an interest in pursuing licensure. Not open to Business and Economics majors.

Economics Minor

This minor is designed to give students from other majors a general competency in economics. Students are encouraged to meet with the advisor of the Economics Minor to develop a course of study that complements their major curriculum. For more information, contact the Economics Area office.

Entrepreneurship Minor

The goal of the Entrepreneurship minor is to empower students to create economic and social value in any discipline. Students in the Entrepreneurship minor will acquire the tools, develop the skills, and cultivate the mindset of an entrepreneur. This minor comprises a carefully-chosen set of courses from across campus leading to a balanced and interdisciplinary approach to entrepreneurship. While the Entrepreneurship minor is open to students from all colleges, it is not open to Business Administration or Economics majors, since those majors are able to choose an Entrepreneurship concentration. There is

an application process and students must be in good standing in their major.

Industrial Technology Minor

The minor in Industrial Technology offers a choice of courses in Technology, Design, Operations, Quality, and Supply Chain. These courses provide supplemental knowledge and skills for nontechnical majors who wish a position related to operations in a company.

Integrated Marketing Communications Minor

The Integrated Marketing Communications Minor provides students with the skills needed to acquire and leverage customer insights, to create and deploy visual, graphic, and written content across traditional and digital media channels, and to analyze the impact. Students use industry standard tools and work collaboratively with peers from complementary disciplines to develop integrated marketing campaigns for companies.

Graduates are in demand for positions in social media, integrated media, content marketing, digital marketing, brand storytelling, visual storytelling, and analytics and optimization. The opportunities and job titles are many and growing.

Packaging Minor

The purpose of this interdisciplinary minor is to complement the non-Industrial Technology and Packaging majors with a planned curriculum in packaging. The program is designed to capitalize on theories and skills learned in other disciplines thereby uniquely preparing students for success as packaging professionals in positions ranging from highly technical research and development through purchasing, production, sales and management.

Students gain the skills needed for the design of package forms and graphics, the specifications of materials and machinery to be used, the evaluation of package systems, as well as the planning and coordinating of packaging requirements. These specialized skills result from an integration of knowledge gained through the packaging curriculum with that of the major discipline. A significant understanding of packaging issues and their impact on the industry is also gained.

Graduate Programs Master of Business Administration

Business Bldg. (03), Room 409
Phone: 805.756.2637
cobgmp@calpoly.edu
<http://cob.calpoly.edu/gradbusiness>

Associate Dean: Sanjiv Jaggia
Program Director: Beena Khurana

Programs of Study/Specializations Available

MBA - General Management Specialization
MBA - Graphic Communication Document Systems Management Specialization

Architecture or Landscape Architecture Pathway

This pathway is only available to students who are enrolled in Cal Poly's Bachelor of Architecture (BArch) program or Bachelor of Landscape Architecture (BLA) program. Students may request permission to enroll in MBA courses during their fifth/final year of study. Upon completion of the BArch or BLA degree, students are eligible to formally apply for admission to the MBA program. Students who fulfill all the requirements first receive their bachelor's degree and then the MBA. Contact the Graduate Programs Office in the Orfalea College of Business for additional information.

Option to Simultaneously Pursue MBA & Another Master's Degree

The Orfalea College of Business permits students to develop an individualized program of study that incorporates the required elements of two distinct Cal Poly graduate degree programs. This option offers graduate students the opportunity to simultaneously pursue an MBA degree in the Orfalea College of Business and a Master's Degree in any one of Cal Poly's other colleges.

To participate in this option, students must apply to, meet the qualifications for, and be accepted into each program independently. Students must first apply for formal admission to one specific Cal Poly graduate program such as the MBA program. After enrollment in a specific graduate program, the student must apply to, meet the qualifications for, and be accepted into the second program. The two degrees must be awarded in the same quarter.

General Characteristics

Cal Poly's MBA programs are designed to prepare students to enter successful management positions in industry, government, and not-for-profit organizations. The programs give graduates a broad management foundation. Cal Poly's MBA programs are 60 to 64 units in length, depending on specialization, and consist of core courses and elective courses.

Tuition and Fees

The MBA programs have separate professional fees associated with them. Please see https://financialaid.calpoly.edu/_finaid/coa.html for more information.

Admission/Acceptance Requirements

Admission to the MBA programs is based upon:

- successful completion of an accredited undergraduate program of study
- prior academic performance with particular emphasis placed on the last 90 quarter units (60 semester units)
- Graduate Management Admission Test (GMAT) or Graduate Records Examination general test (GRE) scores, with particular emphasis on performance on the quantitative portion
- prior work experience (desirable).

Culminating Experience

In order to satisfy the culminating experience requirement, students must satisfactorily complete a comprehensive examination.

PROGRAMS OF STUDY

MBA – General Management Specialization

This program allows students to take electives of particular interest that fit their specific needs or career objectives. The program consists of 36-quarter-units of required courses with the remaining elective units selected from a focused group of advanced courses.

MBA - Graphic Communication Document Systems Management Specialization

This specialization is offered in conjunction with the Graphic Communication Department in the College of Liberal Arts, and is designed for those interested in graphic communication-related management careers. The program, focused on document systems management, contains a strong research component, including research assignments relevant to an individual company and the document industry as a whole. Students participate in research and development projects for the Graphic Communication Institute at Cal Poly.

MS Engineering Management

MS Engineering Management is a concurrent degree that includes courses in the MBA program and in the MS Engineering program with a specialization in Integrated Technology Management. It is a cooperative effort between the Orfalea College of Business and the Cal Poly College of Engineering (Industrial and Manufacturing Engineering Department). The program is focused on developing high quality, career ready graduates with a combination of engineering and business expertise for rapidly changing technological and business environments. Please see MS Engineering Management (p. 404) for more information.

MS Accounting

Business Bldg. (03), Room 409
Phone: 805.756.2637
cobgmp@calpoly.edu
<http://cob.calpoly.edu/gradbusiness>

Associate Dean: Sanjiv Jaggia
Program Director: Herb Hunt

General Characteristics

The MS Accounting program is a one-year academic course of study designed to prepare students for careers that require employees to be licensed as a Certified Public Accountant (CPA). This includes careers with international public accounting firms, regional and local CPA firms, industry and government. The program satisfies CPA accounting study requirements in the state of California.

Tuition and Fees

The MS Accounting program is offered through Extended Education. As such, the program carries a separate tuition and fee schedule available in the Office of the Associate Dean, Orfalea College of Business.

Admission/Acceptance Requirements

Acceptance to the program is based upon an applicant's:

- submission of an application for graduate admission via <https://calstate.edu/apply>,
- successful completion of an accredited undergraduate program of study and (i) four (4) quarter units of taxation *and* (ii) eight (8) quarter units of intermediate financial accounting courses¹
- prior academic performance with particular emphasis placed on performance during the last 90 graded quarter units completed prior to application (or equivalent), and
- achievement on the Graduate Management Admission Test (GMAT) or Graduate Records Examination general test (GRE), with particular emphasis placed on performance on the quantitative portion.

¹ An "intermediate accounting" course includes comprehensive coverage of financial statements, assets, liabilities, investments, intangibles, equities, revenue recognition and the Cash Flows statement.

Culminating Experience

All students are required to pass a comprehensive examination which is normally given during the final quarter of the program.

MS Business Analytics

Business Bldg. (03), Room 409
Phone: 805.756.2637
cobgmp@calpoly.edu
<http://cob.calpoly.edu/gradbusiness>

Associate Dean: Sanjiv Jaggia
Program Director: Kyle Hofer-Mora

General Characteristics

The MS in Business Analytics is a comprehensive, 10-month interdisciplinary business degree program that encompasses economics, finance, accounting, marketing, and information systems. The program offers a holistic approach to data analytics, combining qualitative reasoning with quantitative tools to identify key business problems and translate data analytics into decisions that improve business performance. Students will acquire broad training in all aspects of business analytics with particular emphasis on industry projects, statistical modeling and communication. Students will work on collaborative industry projects to engage with real world problems, and gain valuable experience working for a client in a team.

Tuition and Fees

The MS Business Analytics program is offered through Extended Education. As such, the program carries a separate tuition and fee schedule available in the Office of the Associate Dean, Orfalea College of Business.

Admission/Acceptance Requirements

To qualify for admission to a Master's program, you must meet the Cal Poly university admission requirements for graduate standing, which are described in the Graduate Education (<http://catalog.calpoly.edu/graduateeducation>) section of the Cal Poly Catalog, as well as professional, personal, scholastic and other standards as prescribed by the program. The program specific requirements for admission are as follows:

- Official transcripts of all course work

- Competitive GMAT or GRE score (valid for five years)
- Statement of purpose
- Two letters of recommendation
- Completion of at least two college level courses in statistics
- Completion of at least one college level course in calculus
- Applicants whose native language is not English must have taken TOEFL within the last two years with a minimum score of 550 (paper version) and 213 (computerized version) or 80 (internet based). The TOEFL requirement is waived for certain applicants; see https://admissions.calpoly.edu/applicants/international/toefl_ielts.html for details.

Culminating Experience

The culminating experience for the MSBA program takes the form of several collaborative industry projects, in which students synthesize ideas and techniques learned throughout the program, and apply these to real business challenges. Each student's completed projects are evaluated by a three member faculty panel, in consultation with industry partners and program administration, to complete this requirement.

MS Packaging Value Chain

New program, effective Fall 2017

Business Bldg. (03), Room 409
 Phone: 805.756.2637
cobgmp@calpoly.edu
<http://cob.calpoly.edu/gradbusiness>

Associate Dean: Sanjiv Jaggia
 Program Director: Jay Singh

General Characteristics

The MS in Packaging Value Chain program is a fully online, interdisciplinary degree program that encompasses packaging science, design, marketing, finance, supply chain, operations and statistics. The focus of the program is to present how the package can be used to create value addition and includes courses that build on each other towards a holistic understanding of the global packaging diaspora. The program develops competencies in essential packaging abilities and related business acumen, promotes transference of learning to the workplace for professionals, and provides opportunities for leadership roles.

Recent bachelor's degree graduates in packaging or related disciplines can also seek to significantly enhance their learning towards a high-order perspective of packaging's impact across the global value chains.

Tuition and Fees

The MS Packaging Value Chain program is offered through Extended Education. As such, the program carries a separate tuition and fee schedule available in the Office of the Associate Dean, Orfalea College of Business.

Admission/Acceptance Requirements

To qualify for admission to a Master's program, you must meet the Cal Poly university admission requirements for graduate standing, which are described in the Graduate Education (p. 408) section of the Cal Poly Catalog, as well as professional, personal, scholastic and other standards as prescribed by the program. The program specific requirements for admission to the MS Packaging Value Chain program must be submitted

via the Cal Poly Graduate Education (<http://www.grad.calpoly.edu>) website and are as follows:

- Completion of a bachelor's degree in packaging or a related field from an accredited college or university
- Official transcripts of all course work
- Competitive GMAT or GRE score (valid for five years)
- Statement of purpose
- Two letters of recommendation
- Completion of at least two college level courses in physics, chemistry (including organic chemistry), and statistics
- Completion of at least one college level course in calculus
- Applicants whose native language is not English must have taken TOEFL within the last two years with a minimum score of 550 (paper version) and 213 (computerized version) or 80 (internet based). The TOEFL requirement is waived for certain applicants; see https://admissions.calpoly.edu/applicants/international/toefl_ielts.html for details.

Culminating Experience

The Applied Industry Project course, completed during the last quarter of the program, will provide students with the opportunity to synthesize the ideas and methods they have learned over the duration of the MS Packaging Value Chain program, fulfilling the requirements for a culminating experience as specified in the California Code of Regulations.

MS Quantitative Economics

Business Bldg. (03), Room 409
 Phone: 805.756.2637
cobgmp@calpoly.edu
<http://cob.calpoly.edu/gradbusiness>

Associate Dean: Sanjiv Jaggia
 Program Director: Steve Hamilton

General Characteristics

The master of science degree program in economics is a full-time, four-quarter program designed to provide advanced preparation in econometrics and applied microeconomics for individuals desiring careers as economists or data analysts in the business, financial, or government sectors. The program provides the technical skills required to engage in economic analyses that involve economic modeling, forecasting, numerical optimization, and data analysis.

Tuition and Fees

The MS Economics program is offered through Extended Education. As such, the program carries a separate tuition and fee schedule available in the Office of the Associate Dean, Orfalea College of Business.

Admission/Acceptance Requirements

For admission to the program with a classified or conditionally classified status, a student should hold a bachelor's degree from an accredited institution with a minimum grade point average of 2.5 in the last 90 quarter units (60 semester units) attempted and have completed coursework in intermediate microeconomics, intermediate macroeconomics, econometrics, calculus, and statistics. Applicants are required to submit scores for the General Test of the Graduate Record Examination. An applicant who meets these standards but lacks the prerequisite coursework may be admitted as a conditionally classified

student and must make up any deficiencies before advancement to classified graduate standing.

Culminating Experience

Students are required to pass a written comprehensive exam in economics.

MS Taxation

Business Bldg. (03), Room 409
Phone: 805.756.2637
cobgmp@calpoly.edu
<http://cob.calpoly.edu/gradbusiness>

Associate Dean: Sanjiv Jaggia
Program Director: Rodney P. Mock

General Characteristics

The Master of Science in Taxation at Cal Poly is recognized by the accounting firms as one of the elite programs in taxation. The program is a one-year, full-time comprehensive program, that covers a broad range of specialized tax curriculum; such as, partnership taxation, corporate taxation, state and local taxation, international tax and tax research. The degree program provides students with the opportunity to learn from nationally recognized tax scholars, major industry players and seasoned tax practitioners. Students graduating from the masters are highly sought after by recruiters, and are promoted early in public accounting, government and industry as a result of their tax expertise. The program satisfies CPA accounting study requirements in the state of California.

Winter quarter requires an internship for class credit, where students engage in learn-by-doing at the accounting firms on sophisticated tax transactions.

Tuition and Fees

The MS Taxation program is offered through Extended Education. As such, the program carries a separate tuition and fee schedule available in the Office of the Associate Dean, Orfalea College of Business.

Admission/Acceptance Requirements

Acceptance to the program is based upon an applicant's:

- submission of an application for graduate admission via <https://calstate.edu/apply>,
- successful completion of an accredited undergraduate program of study and (i) four (4) quarter units in federal taxation *and* (ii) eight (8) quarter units in accounting or two (2) years of equivalent experience in accounting,
- prior academic performance with particular emphasis placed on performance during the last 90 graded quarter units completed prior to application (or equivalent), and
- achievement on the Graduate Management Admission Test (GMAT) or Graduate Records Examination general test (GRE), with particular emphasis placed on performance on the quantitative portion.

Culminating Experience

All students are required to pass a comprehensive examination, which is normally given during the final quarter of the program.

BS Business Administration Program Learning Objectives

Students graduating from our program will be able to:

- 1.1 Apply knowledge to identify opportunities and solve business problems.
- 2.1 Evaluate the social and ethical responsibilities of business organizations.
- 3.1 Exhibit the ability to work in a diverse environment.
- 3.2 Illustrate an understanding of business activities in a global environment.
- 4.1 Demonstrate effective written communication skills.
- 4.2 Demonstrate effective oral communication skills.
- 4.3 Demonstrate effective participation in teams.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

BUS 207	Legal Responsibilities of Business	4
BUS 214	Financial Accounting	4
BUS 215	Managerial Accounting	4
BUS 342	Fundamentals of Corporate Finance	4
BUS 346	Principles of Marketing	4
BUS 387	Organizational Behavior	4
BUS 391	Information Systems	4
BUS 401	General Management and Strategy	4
BUS 404	Governmental and Social Influences on Business	4
Technology Management - Select from the following:		4
ITP 303	Lean Six Sigma Green Belt	
ITP 326	Product Design and Development	
ITP 330	Packaging Fundamentals	
ITP 341	Packaging Polymers and Processing	
ITP 371	Supply Chain Management in Manufacturing and Services	
International Business - Select from the following:		4
BUS 301	Global Financial Institutions and Markets	
BUS 302	International and Cross Cultural Management	
BUS 303	Introduction to International Business	
BUS 304	International Supply Chains	

BUS 410	The Legal Environment of International Business	
BUS 446	International Marketing	
ECON 330	International Trade Theory	
Senior Project - Select from the following:		4
BUS 416	Volunteer Income Tax Assistance - Senior Project	
BUS 461 & BUS 462	Senior Project I and Senior Project II	
BUS 463	Senior Project: Low Income Taxpayer Clinic	
BUS 464	Applied Senior Project Seminar	
BUS 466	Senior Project: Sales Development Program	
ECON 464	Applied Senior Project	
Concentration courses (see below)		24-28
SUPPORT COURSES		
ECON 221	Microeconomics	4
ECON 222	Macroeconomics (D2) ¹	4
ECON elective (300-400 level)		4
MATH 221	Calculus for Business and Economics (B1) ¹	4
STAT 251	Statistical Inference for Management I (B1) ^{1,2}	4
STAT 252	Statistical Inference for Management II ²	5
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		60
FREE ELECTIVES		
Free Electives		19-23
Total units		180

¹ Required in Support; also satisfies GE

² STAT 301 (4) and STAT 302 (4) may be used as a substitute for STAT 251 (4) and STAT 252 (5). All students must still complete two approved GE B1 courses. STAT 301 and STAT 302 are not GE courses. Students should follow the advising footnote under the SUPPORT section (p. 182) of the ECON major: "Students pursuing the Quantitative Analysis Concentration should take MATH 141 and MATH 142 instead of MATH 221".

Concentrations

Students may elect to complete curriculum from the following concentrations:

- Accounting (p. 179)
- Consumer Packaging (p. 180)
- Entrepreneurship (p. 180)
- Financial Management (p. 180)
- Information Systems (p. 181)
- Management and Human Resources (p. 181)
- Marketing Management (p. 182)
- Quantitative Analysis (p. 183)
- Real Estate Finance (p. 182)

General Education (GE) Requirements

- 72 units required, 12 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A Communication		
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B Science and Mathematics		
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
Area C Arts and Humanities		
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E Society and the Individual		
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy (4 units in Support) ¹	0
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective (no BUS course)	4
Area F Technology		
F	Upper-division elective	4
Total units		60

¹ Required in Support; also satisfies GE

Accounting Concentration

The Accounting Concentration prepares students for careers in public accounting (tax and audit), private industry, government, and not-for-profit organizations.

BUS 319	Accounting Information Systems	4
BUS 320	Federal Income Taxation for Individuals	4
BUS 321	Intermediate Accounting I	4
BUS 322	Intermediate Accounting II	4
BUS 424	Accounting Ethics	4
BUS 425	Auditing	4
Accounting Elective		
Select from the following:		4
BUS 323	Intermediate Accounting III	
BUS 412	Advanced Managerial Accounting	

BUS 417	Taxation of Corporations and Partnerships	
BUS 422	Accounting for Government and Not-For-Profit Entities	
BUS 474	Independent Study in Accounting	
Total units		28

Consumer Packaging Concentration

Concentration Coordinator: Javier de la Fuente

This concentration provides business majors entry into a rapidly expanding and dynamic field, packaging, that has been fueled by the globalization of manufacturing and customer-supplier relationships. This trend has been enabled by new approaches to value chain management, product development, and packaging technology. This concentration will allow the students to:

1. conceptualize packaging designs that meet customer needs
2. validate designs with data and customer insight
3. gain familiarity with packaging materials and related test equipment
4. conduct qualitative and quantitative marketing analysis for products
5. comprehend packaging costs, sustainability issues and industry trends and
6. understand supply chain management and logistics related issues

Lessons are drawn from a range of established and emerging industries such as food, automotive, healthcare, and electronics.

BUS 418	Listening to the Customer	4
BUS 419	Strategic Marketing Measurement	4
BUS 451	New Product Development and Launch	4
ITP 234	Packaging Design Fundamentals	4
ITP 330	Packaging Fundamentals	4
ITP 475	Packaging Performance Testing	4

Approved Electives

Select from the following:		4
BUS 452	Product Management	
GRC 337	Consumer Packaging	
ITP 233	Product Modeling and Communication	
ITP 341	Packaging Polymers and Processing	
ITP 408	Paper and Paperboard Packaging	
ITP 411	Packaging Sustainability	
ITP 414	Packaging Laws & Regulations	
ITP 415	Supply Chain and Logistics	
ITP 430	Healthcare Packaging	
ITP 485	Packaging Development	

Total units 28

Entrepreneurship Concentration

Concentration Coordinator: Jon York

The goal of the Entrepreneurship concentration is to empower the student to create economic and social value either for a startup or as part of a high-performing entrepreneurial team within an existing organization.

A student in the Entrepreneurship concentration will acquire the tools, develop the skills, and cultivate the mindset of an entrepreneur. The Entrepreneurship concentration comprises a carefully-curated set of required and elective courses, leading to a hands-on, balanced and interdisciplinary approach to entrepreneurship that is applicable in for-profit and non-profit contexts; local and global settings; and service-, product-, or technology- based companies.

BUS 310	Introduction to Entrepreneurship	4
BUS 418	Listening to the Customer	4
BUS 436	Entrepreneurial Finance	4
BUS 488	Planning and Managing New Ventures	4
ITP 428	Commercialization of New Technologies	4

Approved Electives

Select from the following:		8
BUS 311	Managing Technology in the International Legal Environment	
BUS 382	Organizations, People, and Technology	
BUS 384	Human Resources Management	
BUS 392	Business Application Development	
BUS 451	New Product Development and Launch	
BUS 477	Managing Change and Development	
BUS 489	Negotiation	
ECON 337	Money, Banking and Credit	
ITP 302	Developing and Presenting New Enterprise Strategies	
ITP 326	Product Design and Development	
ITP 330	Packaging Fundamentals	
ITP 406	Industrial Sales	
ITP 467	Applied Business Operations	

Advanced Topics in Entrepreneurship

BUS 470 or ITP 470	Selected Advanced Topics Selected Advanced Topics	
-----------------------	--	--

Total units 28

Financial Management Concentration

The Financial Management concentration has three required courses, which provide the students with fundamentals of asset valuation, and applies these principles to different securities (bonds, equity, derivatives, and corporate and real assets). The Finance electives enable the students to specialize and deepen their training.

The following are the required and the elective courses in the FM Concentration.

BUS 431	Security Analysis and Portfolio Management	4
BUS 438	Advanced Corporate Finance	4
BUS 439	Fixed Income Securities Market	4
Select from the following:		12
BUS 432	Insurance Planning and Risk Management	

BUS 433	International Finance
BUS 434	Real Estate Finance
BUS 435	Real Estate Investment
BUS 436	Entrepreneurial Finance
BUS 437	Retirement and Estate Planning
BUS 441	Computer Applications in Finance
BUS 442	Introduction to Futures and Options
BUS 443	Case Studies in Real Estate Finance
BUS 444	Financial Engineering and Risk Management
BUS 445	Ethics and Behavior Finance
BUS 448	The Finance of Mergers and Acquisitions
ECON 339	Econometrics ¹
Approved Electives	
Select from the following	
BUS 320	Federal Income Taxation for Individuals
BUS 321	Intermediate Accounting I
BUS 322	Intermediate Accounting II
BUS 412	Advanced Managerial Accounting
BUS 417	Taxation of Corporations and Partnerships
BUS 425	Auditing
ECON 311	Intermediate Microeconomics I
ECON 313	Intermediate Macroeconomics
ECON 330	International Trade Theory
ECON 337	Money, Banking and Credit
ECON 339	Econometrics ¹
ECON 405	International Monetary Economics
ECON 406	Applied Forecasting
ECON 408	Mathematical Economics
ECON 409	Probability Models for Economic Decisions
ECON 424	Monetary Economics
ECON 440	Advanced Econometrics
Total units	28

¹ ECON 339 cannot double count.

Information Systems Concentration

Concentration Coordinator: Barry D. Floyd

The Information Systems (IS) Concentration prepares students to enter the exciting world of information technology in business. Students learn to integrate key IS concepts and technologies through coursework in database systems, application development, systems analysis and design, software quality, and project management. The IS faculty develop students for professional careers by focusing on teamwork, strong interpersonal skills, turning theory into practice, and employing state-of-the-art technologies in the classroom. IS graduates are in high demand by recruiters because of their ability to apply an understanding of technology to problems while maintaining a focus on the business context. IS graduates enjoy exciting career opportunities as business

analysts, social media developers, consultants, systems developers, website designers, and project managers, among many others.

BUS 392	Business Application Development	4
BUS 393	Database Systems in Business	4
BUS 394	System Analysis and Design	4
BUS 395	Systems Design and Implementation	4
Approved Electives		
Select from the following:		8
BUS 470	Selected Advanced Topics (Technology Supported Collaboration)	
BUS 491	Decision Support Systems	
BUS 495	Software Testing	
BUS 496	Electronic Commerce	
BUS 498	Directed Topics in Information Systems	
BUS 499	Data Communications and Networking	
Total units		24

Management and Human Resources Concentration

Concentration Coordinators: Jean-Francois Coget and A.B. (Rami) Shani

The Management and Human Resources (MHR) concentration prepares students for general leadership and management positions, and careers in more specific Human Resources (HR) positions. Through a resolutely experiential learning approach, the HR portion of the curriculum prepares students to hit the ground running in specific HR functions such as recruitment, staffing, training and development, and compensation, as a starting point for a successful HR career. The Management portion of the curriculum prepares students for entry-level leadership and management positions, such as management training programs in large corporations, management consulting, and managerial positions in family businesses and other small organizations. Students will master readily applicable management skills such as leadership, organizational design, development, and change, global management, and negotiation.

BUS 382	Organizations, People, and Technology	4
BUS 384	Human Resources Management	4
BUS 386	Employee Training and Development	4
BUS 475	Staffing	4
BUS 477	Managing Change and Development	4
Approved Electives		
Select from the following:		8
BUS 310	Introduction to Entrepreneurship	
BUS 407	Managing People in Global Markets	
BUS 471	Compensation	
BUS 489	Negotiation	
Total units		28

Marketing Management Concentration

The Marketing Management Concentration provides students with a rigorous, analytical understanding of marketing and business decision-making. Students learn to generate, analyze, interpret, and present the information that organizations need to satisfy and retain customers; to build brand equity and maximize return on investment; and to develop innovative products and services.

The Marketing Management Concentration provides students with knowledge of a wide range of tools and techniques from fields as diverse as sociology, psychology, anthropology, information technology, new product engineering, and economics. Students learn to leverage information, technology, and knowledge to support innovation in virtually all areas of business, non-profit enterprises, and government.

As a discipline with broad applications, the Marketing Management Concentration offers flexible career paths and work styles. Graduates are in demand for positions in marketing intelligence, product development, product management, advertising, digital marketing, sales, and purchasing.

BUS 418	Listening to the Customer	4
BUS 419	Strategic Marketing Measurement	4
BUS 421	Marketing Analytics and Business Intelligence	4
BUS 451	New Product Development and Launch	4
BUS 452	Product Management	4
BUS 454	Marketing Projects	4
BUS 455	Marketing Strategy	4
Total units		28

Real Estate Finance Concentration

The real estate finance concentration provides a program of study that focuses on emerging trends and issues in real estate markets. Students in the real estate finance concentration learn to apply economic techniques to real estate markets, and to describe, explain, and predict patterns of real estate prices, building production, and real estate consumption. The program prepares real estate professionals for public sector and private industry jobs in real estate analysis, appraisal, corporate asset management, development, insurance and investment.

BUS 434	Real Estate Finance	4
BUS 435	Real Estate Investment	4
BUS 439	Fixed Income Securities Market	4
ECON 434	Urban Economics	4

Approved Electives

Select from the following:		12
AGB 326	Rural Property Appraisal	
BUS 342	Fundamentals of Corporate Finance ¹	
BUS 409	Law of Real Property	
BUS 443	Case Studies in Real Estate Finance	
CM 475	Real Property Development Principles	
CRP 412	Plan Implementation	
CRP 446	Development Review and Entitlement	

ECON 311	Intermediate Microeconomics I ^{2,3}	
ECON 339	Econometrics	
ECON 435	Economics of Land and Water	
Total units		28

- 1 Business Administration majors cannot count BUS 342 toward Approved Electives in the Real Estate Finance concentration.
- 2 Economics majors cannot count ECON 311 toward Approved Electives in the Real Estate Finance concentration.
- 3 Business Administration majors using ECON 311 to meet the upper-division ECON elective in Support for their major cannot count ECON 311 toward Approved Electives in the Real Estate Finance concentration.

BS Economics

Program Learning Objectives

1. Students will be able to recall and interpret intermediate microeconomic theory;
2. Students will be able to recall and interpret intermediate macroeconomic theory;
3. Students will be able to recall and interpret international economic theory;
4. Students will be able to recall and interpret the fundamental tools of quantitative analysis.
5. Students will be able to apply economic theory to analyze important business, economic or social issues;
6. Students will be able to apply algebraic, graphical or statistical methods to analyze important business, economic or social issues;
7. Students will be able to employ economic research methodology to analyze important business, economic or social issues;
8. Students will be able to employ technical writing skills to analyze important business, economic or social issues.
9. Whenever relevant and appropriate, students will be able to identify and examine diverse perspectives when explaining and comparing solutions to important business, economic or social problems;
10. Whenever relevant and appropriate, students will be able to identify and examine the ethical implications of proposed solutions to important business, economic or social problems.

Degree Requirements and Curriculum

In addition to the program requirements on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

ECON 221	Microeconomics	4
ECON 222	Macroeconomics (D2) ¹	4
ECON 311 & ECON 312	Intermediate Microeconomics I and Intermediate Microeconomics II	8
ECON 313	Intermediate Macroeconomics	4

ECON 339	Econometrics	4
ECON 460	Research Methodology in Applied Economics	4
Select from the following:		4
ECON 461 & ECON 462	Senior Project I and Senior Project II	
ECON 464	Applied Senior Project	
ECON electives (300-400 level)		4
ECON electives (400 level)		16
General Curriculum in Economics, or Concentration ²		28
SUPPORT COURSES		
BUS 207	Legal Responsibilities of Business	4
BUS 214	Financial Accounting	4
BUS 215	Managerial Accounting	4
MATH 141	Calculus I (B1) ^{1,3}	4
STAT 301 & STAT 302	Statistics I and Statistics II ⁴	8
Select from the following:		4-8
BUS 391 & BUS 392	Information Systems and Business Application Development	
CSC 101	Fundamentals of Computer Science	
ECON 395	Programming for Economics and Analytics	
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		64
FREE ELECTIVES		
Free Electives		4-8
Total units		180

¹ Required in Major/Support; also satisfies GE.

² Economics majors do not need a to choose a concentration but they can if they choose. Students who choose not to declare a concentration follow the General Curriculum in Economics: Complete at least 8 units 300-400 level ECON coursework plus any 20 units of coursework at 300-400 level.

³ Students pursuing the Quantitative Analysis concentration should take MATH 141 and MATH 142 instead of just MATH 141.

⁴ Four units of GE B1 are needed to meet the GE B1 requirement.

General Curriculum in Economics, or Concentration

Students who choose to follow the General Curriculum in Economics must complete at least 8 units at the 300-400 level of ECON coursework plus any 20 units of coursework at the 300-400 level.

Alternatively, students may elect to complete curriculum from the following concentrations:

- Accounting (p. 179)
- Consumer Packaging
- Entrepreneurship
- Financial Management (p. 180)
- Information Systems (p. 181)
- Management and Human Resources
- Marketing Management
- Quantitative Analysis (p. 183)

- Real Estate Finance (p. 182)

General Education (GE) Requirements

- 72 units required, 8 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A		Communication	
A1	Expository Writing		4
A2	Oral Communication		4
A3	Reasoning, Argumentation and Writing		4
Area B		Science and Mathematics	
B1	Mathematics/Statistics (4 units in Support) ¹		4
B2	Life Science		4
B3	Physical Science		4
B4	One lab taken with either a B2 or B3 course		
Area C		Arts and Humanities	
C1	Literature		4
C2	Philosophy		4
C3	Fine/Performing Arts		4
C4	Upper-division elective		4
Area C elective	(Choose one course from C1-C5)		4
Area D/E		Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)		4
D2	Political Economy (4 units in Major) ¹		0
D3	Comparative Social Institutions		4
D4	Self Development (CSU Area E)		4
D5	Upper-division elective (no ECON course)		4
Area F		Technology	
F	Upper-division elective		4
Total units			64

¹ Required in Major/Support; also satisfies GE.

Quantitative Analysis Concentration

Emphasizes the skills needed to analyze market data in fast-paced industries such as manufacturing, financial services, and advertising, and provides the technical training required to engage in consulting. There is also a continued need for quantitative analysis by lawyers, accountants, engineers, health service administrators, urban planners, and local, national, and international government agencies. The concentration prepares students for jobs that entail forecasting, data analysis and quantitative economics, and provides a solid foundation for graduate study in economics and business.

ECON 440	Advanced Econometrics	4
STAT 331	Statistical Computing with R	4

Approved Electives: ¹

Select from the following courses:	20
------------------------------------	----

Analytics

BUS 393	Database Systems in Business
BUS 421	Marketing Analytics and Business Intelligence
BUS 441	Computer Applications in Finance
BUS 491	Decision Support Systems
ECON 339	Econometrics ²
ECON 395	Programming for Economics and Analytics ³
or BUS 392	Business Application Development
or CSC 101	Fundamentals of Computer Science
Statistics and Decision Analysis	
ECON 406	Applied Forecasting
ECON 409	Probability Models for Economic Decisions
IME 301	Operations Research I
IME 305	Operations Research II
STAT 323	Design and Analysis of Experiments I
STAT 324	Applied Regression Analysis
STAT 330	Statistical Computing with SAS
STAT 416	Statistical Analysis of Time Series
STAT 419	Applied Multivariate Statistics
STAT 425	Probability Theory
STAT 426	Estimation and Sampling Theory
STAT 427	Mathematical Statistics
Mathematical Foundations	
ECON 408	Mathematical Economics
MATH 142	Calculus II
MATH 143	Calculus III
MATH 206	Linear Algebra I
MATH 241	Calculus IV
MATH 242	Differential Equations I
MATH 244	Linear Analysis I
MATH 248	Methods of Proof in Mathematics
MATH 304	Vector Analysis
MATH 306	Linear Algebra II
MATH 344	Linear Analysis II
MATH 406	Linear Algebra III
MATH 412	Introduction to Analysis I
MATH 413	Introduction to Analysis II
MATH 414	Introduction to Analysis III
MATH 416	Differential Equations II
MATH 418	Partial Differential Equations
MATH 437	Game Theory
MATH 451	Numerical Analysis I
MATH 452	Numerical Analysis II
MATH 453	Numerical Optimization
Total units	28

¹ Consultation with an advisor is recommended prior to choosing approved electives. Courses in Analytics or in Statistics and Decision Analysis provide a focus in analytics. Courses in Statistics and Decision Analysis or in Mathematical Foundations are recommended for students pursuing post-baccalaureate studies.

² Economics majors cannot count ECON 339 toward electives in the Quantitative concentration.

³ Economics majors cannot count ECON 395 or BUS 392 or CSC 101 toward electives in the Quantitative concentration.

BS Industrial Technology and Packaging

Program Learning Objectives

1. Apply fundamental knowledge and skills to solve management, technology and applied engineering problems.
2. Evaluate the ethical responsibilities in a business or technology context.
3. Relate knowledge of sustainability to practices in industry.
4. Apply decision tools and methods and make recommendations based on their outcome.
5. Demonstrate effective participation and leadership in teams.
6. Demonstrate effective writing and speaking skills.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

ITP 150	Industrial Power Systems	4
ITP 211	Industrial Safety and Quality Program Leadership	4
ITP 233	Product Modeling and Communication	4
ITP 303	Lean Six Sigma Green Belt	4
ITP 326	Product Design and Development	4
ITP 330	Packaging Fundamentals (Area F) ¹	4
ITP 341	Packaging Polymers and Processing (Area F) ¹	4
ITP 371	Supply Chain Management in Manufacturing and Services	4
ITP 406	Industrial Sales	4
ITP 409	Packaging Machinery and Processes	4
ITP 411	Packaging Sustainability	4
ITP 415	Supply Chain and Logistics	4
ITP 461	Senior Project I	2
ITP 462	Senior Project II	2
Concentration courses (see below)		40

SUPPORT COURSES

BUS 214	Financial Accounting	4
or BUS 212	Financial Accounting for Nonbusiness Majors	
BUS 346	Principles of Marketing	4

BUS 391	Information Systems	4
CHEM 111	Survey of Chemistry (B3 & B4) ¹	4-5
or CHEM 124	General Chemistry for Physical Science and Engineering I	
or CHEM 127	General Chemistry for Agriculture and Life Science I	
ECON 201	Survey of Economics (D2) ¹	4
MATH 141	Calculus I (B1) ¹	4
or MATH 221	Calculus for Business and Economics	
PHYS 121	College Physics I	4
PHYS 123	College Physics III	4
STAT 217	Introduction to Statistical Concepts and Methods (B1) ^{1,2}	4
or STAT 218	Applied Statistics for the Life Sciences	
or STAT 251	Statistical Inference for Management I	
or STAT 302	Statistics II	

GENERAL EDUCATION (GE)

(See GE program requirements below.) 52

FREE ELECTIVES

Free Electives 0

Total units 180

¹ Required in Major/Support; also satisfies GE² STAT 302 is not a GE course. All students must complete two approved GE B1 courses.

Concentrations

- Industrial Technology (p. 185)
- Packaging (p. 186)

General Education (GE) Requirements

- 72 units required, 20 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	

D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy (4 units in Support) ¹	0
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective (4 units in Major) ¹	0
Total units		52

¹ Required in Major/Support; also satisfies GE.

Industrial Technology Concentration

The Industrial Technology Concentration offers students a broad education in business and technology management that makes them versatile contributors in a wide variety of industries. Students develop knowledge and skills in operations, supply chain, quality assurance, planning, materials, automation, technology commercialization, and project management. In their selection of approved electives students can specialize or further broaden their education with courses in value chain management, facilities management, lean six sigma, packaging, accounting, business, new technology commercialization, and entrepreneurship.

ITP 260	Manufacturing Processes and Materials	4
ITP 390	Industrial Automation	4
ITP 403	Lean and Quality Systems Management	4
ITP 410	Operations Planning and Control	4
ITP 428	Commercialization of New Technologies	4
ITP 467	Applied Business Operations	4

Approved Electives ¹

Select from the following:		16
BUS 215	Managerial Accounting	
BUS 304	International Supply Chains	
BUS 310	Introduction to Entrepreneurship	
BUS 313	Customer Development	
or BUS 418	Listening to the Customer	
BUS 384	Human Resources Management	
BUS 387	Organizational Behavior	
BUS 389	Introduction to Business Negotiation for Entrepreneurs	
or BUS 489	Negotiation	
ITP 234	Packaging Design Fundamentals	
ITP 275	Industrial Facility Systems and Equipment	
ITP 302	Developing and Presenting New Enterprise Strategies	
ITP 400	Special Problems for Advanced Undergraduates	
ITP 408	Paper and Paperboard Packaging	

ITP 412	Instrumental Analysis of Packaging Polymers	
ITP 413	Packaging Quality Assessment	
ITP 414	Packaging Laws & Regulations	
ITP 419	Cooperative Education/Internship	
ITP 430	Healthcare Packaging	
ITP 475	Packaging Performance Testing	
ITP 485	Packaging Development	
Total units		40

¹ Consultation with an advisor is recommended prior to selecting approved electives; note your selections may impact pursuit of post-baccalaureate studies and/or goals.

Packaging Concentration

Packaging continues to grow beyond being a logistical or materials issue to a strategic business function aimed at creating value. The Packaging Concentration emphasizes on the entire packaging value chain and includes the disciplines of engineering, material science, design and business. Students are encouraged to leverage their personal interests to focus on a multitude of industry sectors such as food, automotive, healthcare and electronics. The highly sought out graduates are provided with opportunities to engage with a multitude of groups ranging from R&D through purchasing, production, sales and management.

ITP 234	Packaging Design Fundamentals	4
ITP 408	Paper and Paperboard Packaging	4
ITP 412	Instrumental Analysis of Packaging Polymers	4
ITP 430	Healthcare Packaging	4
ITP 475	Packaging Performance Testing	4
ITP 485	Packaging Development	4

Approved Electives ¹

Select from the following:		16
FSN 354	Packaging Function in Food Processing	
GRC 337	Consumer Packaging	
ITP 400	Special Problems for Advanced Undergraduates	
ITP 403	Lean and Quality Systems Management	
ITP 410	Operations Planning and Control	
ITP 413	Packaging Quality Assessment	
ITP 414	Packaging Laws & Regulations	
ITP 419	Cooperative Education/Internship	
ITP 428	Commercialization of New Technologies	
Total units		40

¹ Consultation with an advisor is recommended prior to selecting approved electives; note your selections may impact pursuit of post-baccalaureate studies and/or goals.

Accounting Minor

BUS 214	Financial Accounting ¹	4
---------	-----------------------------------	---

BUS 215	Managerial Accounting ²	4
BUS 319	Accounting Information Systems	4
BUS 320	Federal Income Taxation for Individuals	4
BUS 321	Intermediate Accounting I	4
BUS 322	Intermediate Accounting II	4
Select from the following:		4
BUS 323	Intermediate Accounting III	
BUS 417	Taxation of Corporations and Partnerships	
BUS 425	Auditing	
BUS 424	Accounting Ethics	
Total units		28

¹ Students may apply AGB 214 Agribusiness Financial Accounting towards BUS 214 Financial Accounting.

² Students may apply AGB 323 Agribusiness Managerial Accounting towards BUS 215 Managerial Accounting.

Economics Minor

Required Courses

ECON 221	Microeconomics	4
ECON 222	Macroeconomics	4
ECON 311	Intermediate Microeconomics I	4
ECON 312	Intermediate Microeconomics II	4
ECON 313	Intermediate Macroeconomics	4

Electives

400 level ECON courses:		8
Total units		28

Entrepreneurship Minor

Required Courses

BUS 220	Business Basics for Entrepreneurs	4
BUS 310	Introduction to Entrepreneurship	4
ENGR 234	Introduction to Design Thinking	4

Approved Electives

Select from the following (at least 8 units must be 300 or 400 level courses)		12
BIO/CHEM 202	Orientation to Biotechnology	
BUS 311	Managing Technology in the International Legal Environment	
BUS 313	Customer Development	
BUS 389	Introduction to Business Negotiation for Entrepreneurs	
CHEM 441	Bioinformatics Applications	
COMS 317	Technology and Human Communication	
ISLA 123	Introduction to Science, Technology & Society	
ISLA 303 or PHIL 322	Values and Technology Philosophy of Technology	
PHIL 337	Business Ethics	

or PHIL 341 Professional Ethics

Total units 24

Industrial Technology Minor

Technology Electives

Select from the following: 4

ITP 303	Lean Six Sigma Green Belt
ITP 326	Product Design and Development
ITP 371	Supply Chain Management in Manufacturing and Services

Industrial Technology Electives

At least 4 units must be upper division.

A course taken from this list cannot be double counted as a Technology Elective.

Select from the following: 16

ITP 150	Industrial Power Systems
ITP 211	Industrial Safety and Quality Program Leadership
ITP 233	Product Modeling and Communication
ITP 275	Industrial Facility Systems and Equipment
ITP 302	Developing and Presenting New Enterprise Strategies
ITP 303	Lean Six Sigma Green Belt
ITP 326	Product Design and Development
ITP 371	Supply Chain Management in Manufacturing and Services
ITP 400	Special Problems for Advanced Undergraduates
ITP 403	Lean and Quality Systems Management
ITP 406	Industrial Sales
ITP 410	Operations Planning and Control
ITP 415	Supply Chain and Logistics
ITP 419	Cooperative Education/Internship
ITP 428	Commercialization of New Technologies
ITP 467	Applied Business Operations

Organizational Electives

Select from the following: 4

BUS 310	Introduction to Entrepreneurship
BUS 311	Managing Technology in the International Legal Environment
BUS 382	Organizations, People, and Technology
BUS 387	Organizational Behavior
PHIL 337	Business Ethics
PSY 350	Teamwork

Total units 24

Integrated Marketing Communications Minor

BUS 418	Listening to the Customer	4
BUS 453	Digital and New Media Marketing	4
BUS 459	Social Media's Role in Integrated Marketing Communications	4
or GRC 420	Graphic Communication in Integrated Marketing Communications	
or JOUR 415	Advanced Public Relations Practice: CCPR	
GRC 338	Web Development and Content Management	4
or GRC 377	Web and Print Publishing	
JOUR 312	Public Relations	4
JOUR 331	Contemporary Advertising	4
JOUR 342	Public Relations Writing and Editing	4
Total units		28

Packaging Minor

Note: Courses cannot be double counted to meet elective and required courses.

Required Courses

CHEM 110	World of Chemistry	4-5
or CHEM 111	Survey of Chemistry	
GRC 337	Consumer Packaging	3
or FSN 354	Packaging Function in Food Processing	
ITP 330	Packaging Fundamentals	4
Select from the following:		4
PHYS 104	Introductory Physics	
PHYS 121	College Physics I	
PSC 101	Matter and Energy	

Approved Electives¹

Select from the following: 9-10

FSN 334	Food Packaging	
FSN 354	Packaging Function in Food Processing	
GRC 316	Flexographic Printing Technology	
GRC 337	Consumer Packaging ²	
ITP 341	Packaging Polymers and Processing	
ITP 400	Special Problems for Advanced Undergraduates	
ITP 408	Paper and Paperboard Packaging	
ITP 409	Packaging Machinery and Processes	
ITP 411	Packaging Sustainability	
ITP 412	Instrumental Analysis of Packaging Polymers	
ITP 413	Packaging Quality Assessment	
ITP 414	Packaging Laws & Regulations	
ITP 430	Healthcare Packaging	
ITP 475	Packaging Performance Testing	

ITP 485	Packaging Development
Total units	24-26

¹ Consumer Packaging students may not double count required or elective courses in their Concentration for Approved Electives in the Packaging Minor.

² GRC 337 may not be double counted as a required course and as an elective.

MBA - General Management Specialization

Program Learning Objectives

The learning objectives of the MBA programs are for students to be able to:

- 1.1 Demonstrate competency in the following areas of business: management, quantitative methods, economics, accounting, finance, marketing, operations, and strategy.
- 1.2 Demonstrate strategic integration of the above areas.
- 1.3 Demonstrate the ability to apply analytics to decision making.
- 2.1 Recognize issues and create solutions using an approach that reflects ethical values.
- 3.1 Demonstrate knowledge of the issues involved in conducting business in a diverse, global environment.
- 4.1 Demonstrate professional written communications skills.
- 4.2 Demonstrate professional oral communication and presentation skills.
- 5.1 Recognize leadership skills and link to leadership theory.
- 5.2 Demonstrate effective team behaviors.

MBA Core Courses	36
GSB 511	Accounting for Managers
GSB 512	Quantitative Analysis
GSB 513	Organizational Behavior
GSB 523	Managerial Economics
GSB 524	Marketing Management
or GSB 573	Marketing Research
GSB 531	Managerial Finance
GSB 533	Aggregate Economics Analysis and Policy
GSB 534	Lean Operations Management
GSB 562	Seminar in General Management and Strategy
Advisor approved electives	24
Total units	60

MBA - Graphic Communication Documents Systems Management Specialization

MBA Common Required Courses

Select from the following:	36
GSB 511	Accounting for Managers
GSB 512	Quantitative Analysis

GSB 513	Organizational Behavior
GSB 523	Managerial Economics
GSB 524	Marketing Management
or GSB 573	Marketing Research
GSB 531	Managerial Finance
GSB 533	Aggregate Economics Analysis and Policy
GSB 534	Lean Operations Management
GSB 562	Seminar in General Management and Strategy
Specialization Required Courses	
Select from the following:	16
GRC 595	Cooperative Education Experience (8)
GRC 500	Special Problems in Graphic Communication for Graduate Students (8)
Advisor approved Business electives	12
Total units	64

MS Accounting

Program Learning Objectives

Graduates are prepared to:

- 1.1 Analyze financial statement data and conduct business valuations.
- 2.1 Research issues related to accounting standards including international financial reporting standards.
- 3.1 Demonstrate the ability to use databases and develop advanced spreadsheets to analyze financial and auditing information.
- 4.1 Demonstrate the ability to diagram data models and perform risk assessment of internal controls that apply to data/processes.
- 5.1 Recognize and apply ethical and fraud-related concepts in accounting and financial reporting.
- 6.1 Demonstrate effective writing communication skills.
- 6.2 Demonstrate effective oral communication skills.

GSA 540	Taxation of Corporations and Partnerships	4
GSA 541	Advanced Financial Reporting Issues I ¹	4
or GSB 510	Data Visualization and Communication in Business	
GSA 543	Advanced Financial Reporting Issues II	5
GSA 545	Applied Accounting Research and Communications	4
GSA 552	Fraud Auditing and Examination	4
GSA 554	Advanced Spreadsheet Modeling for Accounting	4
GSA 555	Database Modeling and Analysis for Accounting	4
GSA 556	Financial Accounting and Valuation	4
GSB 512	Quantitative Analysis	4
GSB 529	Effective Communication Skills for Managers	4
GSB 530	Data Analytics and Mining for Business ¹	4

or GSA 544 Advanced Enterprise Wide Business Processes for Accounting

Comprehensive Examination

Total units 45

¹ Students will choose between GSA 541 and GSB 510 in the fall quarter and between GSB 530 and GSA 544 in the spring quarter.

MS Business Analytics

Program Learning Objectives

1. Employ key aspects of data management - retrieval, integration and enrichment
2. Apply high ethical standards toward the collection, storage, analysis, and reporting of data
3. Apply modeling tools to data of various types and sizes
4. Visualize data to infer and communicate insights
5. Use data to analyze, inform and solve fundamental business problems

Required Courses

GSB 503	Collaborative Industry Project ¹	8
GSB 510	Data Visualization and Communication in Business	4
GSB 520	Data Management for Business Analytics	4
GSB 530	Data Analytics and Mining for Business	4
GSE 518	Essential Statistics for Econometrics	4
GSE 520	Advanced Econometrics I	4
GSE 524	Computational Methods in Economics	4

Approved Electives

Select from the following:		13
GSB 501	Individual Research	
GSB 516	Strategic Marketing Analytics	
GSB 550	Bayesian Econometrics	
GSB 570	Selected Advanced Topics	
GSB 573	Marketing Research	
GSE 522	Advanced Econometrics II	
GSE 544	Evidence-Based Decision Analysis	

Total units 45

¹ GSB 503 satisfies the culminating experience requirement for the degree.

MS Packaging Value Chain

Program Learning Objectives

1. Specify holistic, efficient and effective solutions in the realm of packaging and its impact across the global value chains.
2. Develop analytical and critical thinking skills towards assessing the value addition proposition of packaging.
3. Analyze and explain local, national, and global ethical issues related to the packaging value chains.

4. Infer the present and anticipated future packaging needs of the global society.
5. Effectively compose written and oral texts for a variety of scholarly, professional, and creative purposes.

Required Courses

GSP 530	Packaging Value Chain	2
GSP 532	Packaging Materials	4
GSP 533	Advanced Packaging Laws and Regulations	3
GSP 535	Packaging Value in Logistics and Supply Chain Management	3
GSP 536	Packaging Design	4
GSP 539	Marketing and Sales for Packaged Products	4
GSP 540	Quantitative Analysis for Packaging	4
ITP 591	Applied Industry Project I	5

Approved Electives

Select from the following:		16
GSB 520	Data Management for Business Analytics	
GSB 534	Lean Operations Management	
GSB 563	International Business Tour	
GSP 541	Corporate Finance for Packaging	
GSP 538	Quality Evaluation of Packaged Products	
ITP 537	Distribution Packaging for Business Managers	

Total units 45

MS Quantitative Economics

Program Learning Objectives

Graduates are prepared to:

1. Exhibit sufficient knowledge of the main quantitative methods of economic analysis (both theoretical and empirical).
2. Are proficient at applying quantitative economics techniques in new and unfamiliar circumstances and will develop the ability to adapt and innovate to solve relevant economic problems.
3. Are able to effectively communicate the implications of their analyses to their relevant audience.

Required Courses

GSE 510	Essential Mathematics for Economic Analysis	4
GSE 511	Microeconomic Analysis	4
GSE 512	Macroeconomic Analysis	4
GSE 518	Essential Statistics for Econometrics	4
GSE 520	Advanced Econometrics I	4
GSE 522	Advanced Econometrics II	4
GSE 524	Computational Methods in Economics	4
GSE 526	Microeconometrics	4
Approved Electives (400-500 level) ¹		13

Comprehensive Exam

Total units	45
-------------	----

- ¹ To be selected with advisor's approval from economics or other courses in masters programs, such as: Master of Business Administration (GSB), Agribusiness (AGB), Master of City and Regional Planning (CRP), Engineering, Mathematics, Master of Public Policy. Maximum 12 units from 400 level courses. Maximum 12 units from courses other than GSE/ECON.

MS Taxation

Program Learning Objectives

Graduates Are Prepared To:

- 1.1 Demonstrate competency in tax research and identify potential solutions to tax issues.
- 1.2 Analyze and solve tax compliance issues through the application of analytic/critical thinking skills.
- 1.3 Apply substantive knowledge in a variety of tax preparation projects during a professional internship experience.
- 2.1 Recognize and apply ethical and professional responsibility requirements to tax practice.
- 3.1 Professionally communicate in writing.
- 3.2 Professionally communicate information through oral presentations.

BUS 417	Taxation of Corporations and Partnerships ¹	4
GSB 529	Effective Communication Skills for Managers	4
GSA 536	Taxation of Trusts, Estates, and Transfer Taxes	4
GSA 537	State and Local Taxation	4
GSA 538	Current Developments in Taxation	4
GSA 539	Clinical Tax Education Internship	9
GSA 546	Tax Research and Administrative Procedures	4
GSA 548	Advanced Individual Taxation and Tax Planning	4
GSA 549	Advanced Taxation of Flow-Through Entities	4
GSA 550	Advanced Corporate Taxation	4
GSA 551	International Taxation	4
Total units		45/49

- ¹ Students who, prior to admission to the program have not successfully completed BUS 417 at Cal Poly (or an identical course elsewhere) will be required to take BUS 417 as a part of this degree program.

College of Engineering

Engineering Bldg. (192), Room 301

Phone: 805.756.2131

<https://engineering.calpoly.edu>

Dean: Amy Fleischer

Interim Associate Dean: Eric Mehiel

Associate Dean: Rakesh K. Goel

Academic Programs

Program name	Program type
Aerospace Engineering	BS*, MS
Biomedical Engineering	BS, MS, Specialization
Civil and Environmental Engineering	MS
Civil Engineering	BS*
Computer Engineering	BS*
Computer Science	BS**, MS, Minor
Computing for Interactive Arts	Minor
Electrical Engineering	BS*, MS
Engineering	MS
Environmental Engineering	BS*
Fire Protection Engineering	MS
General Engineering	BS
Industrial Engineering	BS*, MS
Manufacturing Engineering	BS*
Materials Engineering	BS*
Mechanical Engineering	BS*, MS
Multidisciplinary Design	Minor
Software Engineering	BS*

Joint Programs

Program name	Program type
Cross Disciplinary Studies Minor in Data Science	Minor
Engineering Management	MBA/MS
Environmental Studies	Minor
Liberal Arts & Engineering Studies	BA
Transportation Planning	MCRP/MS

Graduate Certificate Programs

Program name	Program type
Fire Protection Engineering Applications	Certificate
Fire Protection Engineering Science	Certificate

* Engineering programs accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org/>

** BS Computer Science program accredited by the Computing Accreditation Commission of ABET, <http://www.abet.org/>

Engineering and computer science programs at Cal Poly are strongly oriented toward preparing graduates for immediate entry into professional practice. Students declare their majors when they enter as freshmen, and they generally take at least one course in that major each quarter. This early introduction better motivates and prepares students to master the foundational mathematics, basic science, and engineering

science or computer science central to success in all the engineering disciplines.

The undergraduate bachelors of science engineering disciplines listed above provide the education needed for entry to the engineering profession and for continued academic work toward advanced degrees. Many of our graduates enter graduate programs at Cal Poly or other institutions. Cal Poly engineering and computer science graduates are highly desired by industry and find a variety of professional opportunities awaiting them, such as engineering design, computer hardware and software engineering, test and evaluation, systems analysis, modeling and simulation, manufacturing, applied research, development, sales and field engineering. Graduates pursue careers in a broad cross-section of industry, government agencies, public utilities, marketing groups, and educational institutions.

The College of Engineering is an internationally-recognized, premier undergraduate engineering college. Its mission is to provide an excellent Learn by Doing education and to graduate in-demand, Day One-ready professionals. The College vision is to transform students into world class, innovative and collaborative engineers to meet the challenges of the 21st century.

State-of-the-art facilities and laboratories form the core of Engineering's project-centered curriculum. Ranging from the Aircraft Design Lab to the Rotor Dynamics Laboratory, these facilities offer advanced technological systems that allow students to link theory with practice. College buildings also promote interdisciplinary project activities, including the Advanced Technology Laboratories, Bonderson Projects Center, and Engineering IV. With 19,000 square feet of space for individual and team-based projects, the Bonderson Center offers enriched opportunities for multidisciplinary projects and collaboration with industry. Engineering IV, a 104,000-square-foot building includes modern classrooms and laboratories for aerospace, mechanical, civil, environmental, industrial and manufacturing engineering programs.

Engineering Student Services

Engineering South (40), Room 111

Phone: 805.756.1461

Director: Kim Marsalek

Engineering Student Services coordinates and provides support to foster retention and graduation. Through our Advising, Multicultural Engineering (MEP), International Exchange (IEP) and Tutoring Programs our staff provides individual and group advising sessions, workshops, and programs to guide and empower students through their undergraduate experience.

Advising Center

Engineering South (40), Room 111

Phone: 805.756.1461

<https://eadvise.calpoly.edu>

Senior Academic Advisor: Dawn Sirois

Academic Advisor: Ashlee Burt

Academic Advisor: Greg Roldan

Academic Advisor: Jamey Stamets

Academic Advisor: Maria Zavala

The Advising Program within Engineering Student Services is dedicated to providing effective and comprehensive support to current undergraduate engineering students. Through individual and group advising sessions, workshops, programs, and technology, the staff helps

students understand university and college policies and procedures, such as, change of major, academic probation, and readmission. Advising's academic services promote student success and development while assisting students in navigating and interpreting the curricula to reach their academic goals.

Multicultural Engineering Program (MEP)

Engineering South (40), Room 115
Phone: 805.756.1433
<https://mep.calpoly.edu>

Coordinator: Jackie Duerr
MEP Advisor: Meghan Palasweski

The Multicultural Engineering Program (MEP) within Engineering Student Services is an academic support program designed to recruit, retain and graduate a diverse population of students, especially groups which continue to remain the most underrepresented in engineering. This includes but is not limited to aspiring College of Engineering students who are first in their family to earn a baccalaureate degree, or from family backgrounds of limited financial resources and less educational opportunities. MEP leverages a strong support network to build an academic community and provide the necessary bridges for students' academic and professional success.

International Exchange Program (IEP)

Engineering South (40), Room 111
Phone: 805.756.1461
<https://eadvise.calpoly.edu/iep>

IEP Advisor: Maria Zavala

The College of Engineering has established exchange agreements with reputable engineering overseas universities. These exchange program differ from other study abroad programs, in that they offer students the opportunity to attend overseas universities with an engineering focus, while paying Cal Poly tuition. The partner universities have been specifically selected by the College for their innovative technology and engineering coursework. Most of our partner universities guarantee on-campus housing and offer courses in English, making it easier for our students to take coursework to meet their degree requirements. Participation brings many lasting benefits that enhance students' educational, personal and professional life. Students typically return with improved communication skills, a better understanding of other cultures, a global engineering perspective, and a more marketable resume for industry. The current list of partner universities is located at: <https://eadvise.calpoly.edu/iep>.

Tutoring Program

Engineering South (40), Room 113
Engineering Bldg. (192), Room 133
Phone: 805.756.1461
<https://eadvise.calpoly.edu/tutoring/>

Engineering Student Services offers tutoring in two different locations. The Engineering Student Services lab (Building 40 Room 113) offers assistance in engineering, math and science courses. The Engineering Mechanics Success Center (Building 192 Room 133) offers assistance in statics, dynamics, strength of materials and thermodynamics. The tutors are trained to assist students in material based on each student's unique

learning style to help the student excel on their own. The current tutoring schedule is located at: <https://eadvise.calpoly.edu/tutoring/>.

Women's Engineering Program (WEP)

Engineering South (13), Room 216
Phone: 805.756.2350
<http://wep.calpoly.edu>

Director: Helene Finger

The mission of the Women's Engineering Program (WEP) is to recruit and retain women engineering and computer science students by focusing on outreach, on-campus support and professional preparation objectives. To meet these objectives, WEP works closely with the Society of Women Engineers (SWE) Cal Poly student section, one of the top student sections in the nation, in supporting a variety of programs directed at pre-college, undergraduate and graduate students.

Outreach activities are directed at students from kindergarten through community college. These programs are designed to encourage pre-university women and girls to consider engineering as a career choice. Outreach recruitment activities include: Building an Engineer workshops, High School Shadow an Engineering Student day, Girl Scout Engineering Badge day, robotics competitions, elementary school workshops, and career fairs.

The Women's Engineering Program provides on-campus support to Cal Poly women engineering students through a variety of academic, leadership and social activities. These activities help students connect to their peers while concurrently assisting them in achieving their educational goals.

On-campus support activities include: scholarships, academic counseling and referrals, pre-registration counseling, big sibling program, test files, SWE meetings, social events, and community service activities.

Professional preparation activities are designed to prepare students for a productive career by facilitating networking with professionals and corporations. Professional preparation activities include: Evening With Industry banquet, Team Tech national design competition, Industry Tours, Resume Book, bi-weekly industry presentations and corporate information sessions.

Graduate Programs

MS Engineering

General Characteristics

The Master of Science degree program in Engineering has the following goals:

- Provide an empowering terminal professional degree for students who intend to become practicing engineers, retaining the strong laboratory emphasis and industrial interaction found in the BS curriculum.
- Provide preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree.
- Provide job-entry education for the more complex and evolving interdisciplinary areas of engineering, such as research and development, innovative design, systems analysis and design, bio-engineering, biomedical engineering, manufacturing, mechatronics, and engineering management.
- Update and upgrade opportunities for practicing engineers.

- Allow graduates to maintain currency in their fields.

To meet the above goals, and to prepare graduates to become effective professionals and leaders, the MS program has the following learning outcomes;

1. Technical competency;
2. Effective communication skills;
3. Awareness of the impacts of technology on society and the environment;
4. Understanding the ethics and responsible professional conduct;
5. Strong interpersonal and teamwork skills;
6. Appreciation of the need for life-long learning;
7. Leadership/planning/decision-making skills;
8. Critical thinking/complex problem-solving skills.

A number of these desired learning outcomes are similar to some of the ABET program outcomes ("A through K") that guide the accreditation process for our undergraduate degree programs. One expects that persons entering our graduate programs, whether or not from an undergraduate engineering program, would already possess many of these attributes to a significant degree. The graduate education would be expected to provide substantial enhancement. Consequently, the learning outcomes for the graduate programs build on the foundation of undergraduate engineering education while taking a more advanced focus appropriate for graduate-level study.

Prerequisites

For admission as a classified graduate student, an applicant should hold a bachelor's degree in engineering or a closely related field with a minimum grade point average of 2.5 in the last 90 quarter units (60 semester units) attempted. Some programs impose higher GPA requirements. Applicants for most graduate engineering programs are required to submit scores for the General Test of the Graduate Record Examination. An applicant who meets program standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing. Contact the individual program graduate coordinator for details.

Program of Study

Each graduate student must prepare a formal study plan with his or her advisor early in the program, usually before the 12th unit of approved courses is completed.

The formal program of study must include a minimum of 45 units (at least 23 of which must be at the 500 level) with a specialization in one of the following areas: Biochemical Engineering, Bioengineering, Biomedical Engineering, Integrated Technology Management, Materials Engineering, Water Engineering, or another individualized course of study.

Requirements

The broad curriculum requirements for the Master of Science degree in Engineering are:

1. a number of required units in the field of specialization, in many cases supplemented by analytical and technical breadth requirements;
2. additional units taken as advisor-approved electives;
3. at least 23 units of the 45 unit program at the 500 level;

4. at least 32 units taken "in residence."

In some specializations, two culminating requirement options are available: a thesis/project option, which requires coursework and an up-to-9 unit thesis or project with oral defense; or a non-thesis/project option, which involves additional coursework and a comprehensive examination. The non-thesis option is normally allowed only for students who have completed a senior project or have had significant prior engineering project experience.

The College of Engineering offers two joint programs: in conjunction with the Orfalea College of Business, the MS Engineering Management (p. 404); and with the College of Architecture and Environmental Design (City and Regional Planning Department), the MCRP/MS Engineering, with a specialization in Transportation Planning (p. 406).

MS Engineering, Specialization in Bioengineering

NOTE: Applications to the Bioengineering Specialization are not currently being accepted. Contact the College of Engineering for further information.

MS Engineering, Specialization in Biomedical Engineering

NOTE: Applications to the Biomedical Specialization are not currently being accepted. Contact the College of Engineering for further information.

MS Engineering, Specialization in Integrated Technology Management

The Master of Science in Engineering with a specialization in Integrated Technology Management is designed as a terminal degree program with a professional focus. Its objectives are to provide the student greater breadth and depth of technical knowledge and to help the student practice communication, leadership, and project management skills.

The program has flexible curriculum allowing the student a wide choice in course selection. A student can choose technical elective courses from the Industrial and Manufacturing Engineering department as well as outside the department. Flexibility is emphasized so that the student and his/her advisor can structure a degree plan tailored to the individual needs of the student. Only letter-graded courses count toward satisfying the total unit requirement for the degree. Courses on a credit/no credit basis are not allowed in the formal study plan. No audit credits are permitted.

The program does not require a thesis. A student is required to complete a project in which he/she typically works in industry and applies engineering knowledge and methods to solve a practical complex problem. The student is required to document his/her project with a final report, which will be reviewed by the project advisor in the Industrial and Manufacturing Engineering department.

MS Engineering, Specialization in Water Engineering

MS Fire Protection Engineering General Characteristics

The profession of Fire Protection Engineering is directed toward the identification, analysis and mitigation of fire hazards and risks across a broad spectrum of applications, including buildings, consumer products, industrial processes, transportation vehicles, infrastructure facilities and the wildland-urban interface.

The Master of Science in Fire Protection Engineering prepares individuals to assess and reduce the potential for property and human loss from

fire in these and other settings. Students learn to analyze how buildings are used, how fires start, how fires grow, and how fire and smoke affect people, buildings and property. Fire protection engineers use the latest engineering and construction technologies to:

1. Design systems that control fires, alert people to danger and provide means for escape;
2. Evaluate buildings to identify fire risks of and the means to prevent or mitigate them;
3. Conduct fire safety research on consumer products and construction materials; and
4. Investigate fires to discover how fires start, how they spread, why protective measures fail, and how those measures could be designed more effectively.

To meet these program goals, the fire protection engineering curriculum requires that students successfully complete a total of 45 units including a fire protection engineering project as the culminating experience (FPE 596). The culminating experience will be innovative and require independent thinking. Typically, the students will perform a detailed fire and life safety evaluation of a selected building, the preparation of a comprehensive report documenting the results of this evaluation and the presentation of their analysis and findings in an oral defense to a review committee. Other innovative culminating experiences of similar scope and complexity may be submitted for approval.

Program Goals

The Fire Protection Engineering program is designed to build on the skills, knowledge, and broad engineering principles students acquire in an undergraduate engineering program. The required and elective courses composing the Master of Science degree in Fire Protection Engineering address the specific body of knowledge required by the fire protection engineering profession. Students completing the program will possess the technical knowledge, skills and tools required to practice fire protection engineering in a variety of local, national and international settings. Upon completion of this program, students should possess the necessary knowledge and skills to pursue professional certification and licensure in the fire protection engineering discipline. Furthermore, the program addresses unique fire challenges faced by California and other western states, including wildland-urban interface fires and post-earthquake fires. Upon completing the requirements for a Master of Science degree in Fire Protection Engineering, students should be able to:

- Identify relevant fire safety codes, standards and regulations, comprehend the fire safety performance objectives and criteria associated with these documents, and apply these fire safety objectives and criteria to a broad range of applications.
- Analyze the flammability characteristics of different materials, interpret the results of standard and non-standard fire test methods and evaluate the fire hazards associated with different materials in a range of anticipated settings.
- Analyze the dynamics of fires in and around buildings and other structures through the application of fundamental principles and the use of state-of-the-art computer-based fire simulation models.
- Understand how people interact with fire conditions in buildings and calculate evacuation times through the application of fundamental principles of people movement and the use of state-of-the-art computer-based evacuation models.
- Design fire detection and alarm systems, fire suppression systems, smoke management systems, egress systems and structural fire protection to achieve specified performance objectives.

- Perform comprehensive fire and life safety evaluations of buildings and other structures through application of the knowledge, skills and tools acquired in this program and effectively communicate the results and findings of such evaluations.

Prerequisites

For admission as a classified graduate student, an applicant should hold a bachelor's degree in engineering or a closely related field from a regionally accredited institution, college, or university. An undergraduate grade point average of 3.0 is required. On occasion, where other credentials are exceptionally strong, a GPA in the 2.5-3.0 range may be accepted.

Tuition and Fees

As a special session program through Extended Education, the MS Fire Protection Engineering program is administratively and academically completely self-supporting. As such, the program carries a separate tuition and fee schedule. Please refer to <http://www.fpe.calpoly.edu/financial/index.html> for the current cost of the program.

MS Engineering Management

MS Engineering Management is a concurrent degree that includes courses in the MBA program and the MS Engineering program with a specialization in Integrated Technology Management. It is a cooperative effort between the Orfalea College of Business and the Cal Poly College of Engineering (Industrial and Manufacturing Engineering Department). Please see MS Engineering Management (p. 404) for more information.

MCRP/MS Engineering, Specialization in Transportation Planning

The The MCRP/MS Engineering with Specialization in Transportation Planning (p. 406) is a joint interdisciplinary program between the College of Engineering and the City and Regional Planning Department of the College of Architecture and Environmental Design. Participation in the program requires enrollment in both Colleges. Participants successfully completing the program are awarded both the MCRP and the MS in Engineering, each with a Specialization in Transportation Planning.

Graduate Certificate Programs Fire Protection Engineering Applications

General Characteristics

The courses offered in the Fire Protection Engineering Applications graduate certificate program will prepare students for a specialized career in fire protection engineering. Students completing the certificate program will be prepared for careers in:

- Consulting/Design Engineering Firms
- Fire Equipment and Systems Manufacturers
- Hospitals and Health Care Facilities
- Insurance Industry
- Research and Testing Laboratories
- Fire Departments
- Government

Program Goals

Upon completing the requirements for the graduate certificate, students should be able to:

1. Identify relevant fire safety codes, standards and regulations, comprehend the fire safety performance objectives and criteria associated with these documents, and apply these fire safety objectives and criteria to a broad range of applications.
2. Understand how people interact with fire conditions in buildings and calculate evacuation times through the application of fundamental principles of people movement and the use of state-of-the-art computer-based evacuation models.
3. Design fire detection and alarm systems, fire suppression systems, structural fire protection systems, and egress systems to achieve specified performance objectives.

To meet these program goals, the fire protection engineering applications curriculum requires that students successfully complete a total of 16 units.

Fire Protection Engineering Science

General Characteristics

The courses offered in the Fire Protection Engineering Science graduate certificate program will prepare students for a specialized career in fire protection engineering. Students completing the certificate program will be prepared for careers in:

- Forensic Investigations;
- Nuclear Fire Safety;
- Fire Science Research (R&D facility, Testing Lab, etc.)
- Government
- Fire Departments

Program Goals

Upon completing the requirements for the graduate certificate, students should be able to:

1. Apply concepts associated with the thermal sciences, including thermodynamics, fluid mechanics, and heat transfer, to the analysis of fire protection engineering problems.
2. Analyze the flammability characteristics of different materials, interpret the results of standard and non-standard fire test methods and evaluate the fire hazards associated with different materials in a range of anticipated settings.
3. Analyze the dynamics of fires in and around buildings and other structures through the application of fundamental principles and the use of state-of-the-art computer-based fire simulation models.

To meet these program goals, the fire protection engineering science curriculum requires that students successfully complete a total of 16 units.

Fire Protection Engineering Science & Fire Protection Engineering Applications

Tuition and Fees

As a special session programs through Extended Education, the MS Fire Protection Engineering program and Fire Protection Engineering graduate certificate are administratively and academically completely

self-supporting. As such, the programs carry a separate tuition and fee schedule. Please refer to <http://www.fpe.calpoly.edu/financial/index.html> for the current cost of the program.

Blended BS + MS Engineering Program

The blended program provides motivated students with an accelerated route to the MS Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

Students who matriculate from an ABET accredited BS program into this blended program have an additional requirement for their thesis. ABET requires that curricula include a major design experience, to ensure that students are ready for engineering practice. The experience should build on prior coursework, and should incorporate engineering standards and constraints. Hence, students matriculating from an ABET accredited program must have a master's thesis that includes this major design experience in order to complete their undergraduate degree requirements.

Eligibility for Blended BS+MS Engineering

Students majoring in BS General Engineering, BS Computer Engineering, BS Manufacturing Engineering, and BS Materials Engineering may be eligible to pursue the blended program toward the MS Engineering with a specialization in Bioengineering, Biomedical Engineering, or Integrated Technology Management. They may also be able to pursue blended programs incorporating other MS degrees or specializations in the College of Engineering.

In addition, students in departments with their own master's degrees may be able to pursue masters degrees in other areas, or the MS Engineering degree via the blended program, based on agreements between their bachelors granting program and their target masters program.

Participation in the program is based on prior academic performance and other measures of professional promise. Students are selected by a faculty committee, chosen on the basis of the student's area of interest.

Program of Study

Some programs allow students to complete a capstone experience that integrates the senior project with the graduate thesis. This arrangement also increases the possibilities for industrial interaction in students' professional programs.

The blended program may allow students to earn graduate credit for several senior electives, effectively decreasing the summed unit requirements for both degrees. Requirements concerning shared units vary by degree program. Contact the program graduate coordinator for details.

Other Blended Programs

Blended BS+MS programs are also available in Aerospace Engineering (p. 198), Biomedical Engineering (p. 203), Civil and Environmental Engineering (p. 209), Computer Science and Software Engineering (p. 219), Electrical Engineering (p. 231), Industrial Engineering (p. 240), and Mechanical Engineering (p. 251). Additional information about these programs may be obtained from the individual departments.

MS Engineering, Specialization in Bioengineering

NOTE: Applications to the Bioengineering Specialization are not currently being accepted. Contact the College of Engineering for further information.

Required Courses

ENGR 551	Advanced Topics in Bioengineering	4
ENGR 581	Biochemical Engineering	4
ENGR 599	Design Project (Thesis)	9
MATE 530	Biomaterials	4
Select from the following:		12
CSC 471	Introduction to Computer Graphics	
CSC 473	Advanced Rendering Techniques	
CSC 474	Computer Animation	
ENGR 451	Special Topics in Bioengineering	
ENVE 443	Bioremediation Engineering	
ENVE 536	Biological Wastewater Treatment Engineering	
IME 507	Graduate Seminar	
MATE 425	Corrosion Engineering	
ME 401	Stress Analysis	
ME 504	Finite Element Analysis	
ME 552	Advanced Heat Transfer I	
ME 553	Advanced Heat Transfer II	
ME 554	Computational Heat Transfer	
ME 556	Advanced Heat Transfer III	
STAT 419	Applied Multivariate Statistics	
STAT 511	Statistical Methods	
STAT 542	Statistical Methods for Engineers	

Approved Engineering Electives

Electives	12
Total units	45

MS Engineering, Specialization in Biomedical Engineering

NOTE: Applications to the Biomedical Specialization are not currently being accepted. Contact the College of Engineering for further information.

Required Courses

BMED 450	Contemporary Issues in Biomedical Engineering	4
BMED 460	Engineering Physiology	4
BMED 530	Biomaterials	4
BMED 550	Current and Evolving Topics in Biomedical Engineering	4
BMED 563	Biomedical Engineering Graduate Seminar	2
BMED 599	Design Project (Thesis) ¹	9

Approved Engineering, Science and Mathematics Electives

Electives	18
Total units	45

¹ BMED 591 and/or BMED 592 are not required but can substitute for up to 4 units of thesis.

MS Engineering, Specialization in Water Engineering

Required Courses

Advanced Mathematics and Analytical Methods for Engineering		6
ECON 410	Public Finance and Cost-Benefit Analysis	4
BRAE 414	Irrigation Engineering	4
BRAE 532	Water Wells and Pumps	4
BRAE 533	Irrigation Project Design	4
CE 533	Advanced Water Resources Engineering	4

Select one of the following: 9

BRAE 599	Thesis in BioResource and Agricultural Engineering (2, 2, 5)
CE 599	Design Project (Thesis) (2, 2, 5)
9 units of approved technical electives and written comprehensive examination	

Approved Electives

Select from the following (at least 5 units must be at the 500-level): 10

BRAE 405	Chemigation
BRAE 435	Drainage
BRAE 440	Agricultural Irrigation Systems
CE 434	Groundwater Hydraulics and Hydrology
CE 435	Engineering Hydrology
CE 440	Hydraulic Systems Engineering
CE 535	Water Resources Systems Planning and Analysis
CE 536	Computer Applications in Water Resources with Geographic Info Systems (GIS)
ENVE 436	Introduction to Hazardous Waste Management
ENVE 438	Water and Wastewater Treatment Design
ENVE 535	Physico-Chemical Water and Wastewater Treatment
ENVE 542	Sustainable Environmental Engineering

Total units	45
-------------	----

MS Fire Protection Engineering

Required Courses

FPE 501	Fundamental Thermal Sciences	4
FPE 502	Fire Dynamics	4

FPE 503	Flammability Assessment Methods	4
FPE 504	Fire Modeling	4
FPE 521	Egress Analysis and Design	4
FPE 522	Fire Detection, Alarm and Communication Systems	4
FPE 523	Water-based Fire Suppression	4
FPE 524	Structural Fire Protection	4
FPE 596	Culminating Experience in Fire Protection Engineering ¹	5

Technical Electives

Select from the following: 8

FPE 551	Fire Safety Regulation and Management
FPE 552	Smoke Management and Special Hazards
FPE 554	Forensic Fire Analysis
FPE 555	Fire Protection Management in the Wildland-Urban Interface (WUI)
FPE 556	Advanced Heat Transfer III
ME 541	Advanced Thermodynamics
ME 554	Computational Heat Transfer

Total units 45

¹ FPE 599 Design Thesis can substitute for FPE 596 and one technical elective for a total of 9 units.

FPE 501	Fundamental Thermal Sciences	4
FPE 502	Fire Dynamics	4
FPE 503	Flammability Assessment Methods	4
FPE 504	Fire Modeling	4
Total units		16

Fire Protection Engineering Applications Graduate Certificate

Prerequisites

For admission as a classified graduate student, an applicant should hold a bachelor's degree in engineering, fire science, fire protection and safety, or a closely related field from a regionally accredited institution, college, or university. An undergraduate grade point average of 3.0 is required. On occasion, where other credentials are exceptionally strong, a GPA in the 2.5-3.0 range may be accepted.

Core Courses

FPE 521	Egress Analysis and Design	4
FPE 522	Fire Detection, Alarm and Communication Systems	4
FPE 523	Water-based Fire Suppression	4
FPE 524	Structural Fire Protection	4
Total units		16

Fire Protection Engineering Science Graduate Certificate

Prerequisites

For admission as a classified graduate student, an applicant should hold a bachelor's degree in engineering or a closely related field from a regionally accredited institution, college, or university. An undergraduate grade point average of 3.0 is required. On occasion, where other credentials are exceptionally strong, a GPA in the 2.5-3.0 range may be accepted.

Aerospace Engineering

Engineering III Bldg. (41A), Room 134
Phone: 805.756.7172
<https://aero.calpoly.edu>

College of Engineering Advising Center
Engineering South (40), Room 114
Phone: 805.756.1461; Fax: 805.756.2376

Department Chair: David Marshall

Academic Programs

Program name	Program type
Aerospace Engineering	BS, MS
Multidisciplinary Design	Minor

The mission of the Aerospace Engineering Department is to collaborate with the Aerospace Industry to build partnerships which promote excellence and innovation to serve diverse communities. We work as a team to provide an excellent Learn-by-Doing, systems and design focused engineering education; graduating Day One-ready professionals.

We accomplish our mission using a laboratory-based, hands-on approach to education students. This approach, coupled with a systems view of engineering, is encouraged through coursework and a group-based capstone design experience. This educational philosophy yields engineers capable of working in positions of technical responsibility and leadership in a modern multidisciplinary, systems-based industry.

The Bachelor of Science degree in Aerospace prepares students for engineering work in the exciting aerospace industry. The problems faced by the aerospace industry offer an unusual engineering challenge. Much of the analysis and testing must be accomplished at the very frontiers of technology and performance. Nevertheless, complex aerospace systems must be designed and manufactured; thus, an exceptionally wide range of engineering and problem solving abilities is required. Aerospace Engineering graduates obtain employment in all areas of the aerospace industry with a strong focus on aircraft and spacecraft design.

Aerospace Engineering students can choose between an Aeronautics or Astronautics concentration. Within Aeronautics, students learn the fundamentals of aerodynamics, flight mechanics, materials, structures, propulsion, and stability and control. Within Astronautics, students learn the fundamentals of orbital mechanics, space environment, space structures, telecommunications, attitude dynamics and control, and rocket propulsion. Both concentrations culminate with a Senior Design capstone course where students put theory into practice using a disciplined systems engineering approach to either aircraft or spacecraft design.

The BS degree program in Aerospace Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org/>. It places emphasis on both analysis and design, with supplementary basic work in laboratory projects. Throughout the entire program there is constant interplay between theory and application. Opportunities are available for advanced elective work in the student's field of special interest.

The program maintains laboratory facilities for fabrication, air breathing and space propulsion, structures and composites,

aerodynamics, dynamics and control, flight simulation and flight test, aerothermodynamics, advanced computation, and design.

Aerospace students may participate in two student chapters of national professional societies—the American Institute of Aeronautics and Astronautics and the Society for the Advancement of Material and Process Engineering. There is also a student chapter of the national aerospace engineering honor society, Sigma Gamma Tau. In addition, students have the opportunity to work on CubeSats and Autonomous Flight Systems, through other club activities or faculty research.

Undergraduate Programs

BS Aerospace Engineering

The Bachelor of Science degree in Aerospace Engineering prepares students for engineering work in the exciting aerospace industry. The aerospace industry is known for designing and building complex systems which push the limits of technology. Therefore a strong emphasis is placed on turning theory into practice and problem solving using a disciplined systems engineering approach. The program's faculty have developed a number of educational objectives to support this mission. These objectives are:

- Be life-long learners who continue to pursue professional development;
- Participate and thrive in a multi-disciplinary, systems-oriented work environment;
- Contribute to the solution of complex technical problems that exist in the aerospace industry; and
- Understand their ethical role as a professional engineer and strive to promote a practice of integrity, tolerance, and respect in the workplace.

Concentrations

Aeronautics
Astronautics

Multidisciplinary Design Minor

The minor enhances students' ability to work in multidisciplinary engineering teams. The students develop an understanding of the design process and the role of systems engineering in product design and development including costs analysis. They also learn the systems integration process and how different subsystems are interfaced to develop a successful product.

Graduate Programs

MS Aerospace Engineering

General Characteristics

The Master of Science program in Aerospace Engineering prepares the student for entry into a well-established field of aerospace engineering. The MS program emphasizes engineering science and research activity. Graduates have an increased capability for complex research, development, and innovative design, and are prepared for further study in engineering, leading to a Ph.D. or advanced positions within industry.

Prerequisites

For admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter

units (60 semester units) attempted. Applicants are required to submit satisfactory scores for the General (Aptitude) Test of the Graduate Record Examination.

An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing. Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Department of Aerospace Engineering.

Program of Study

A thesis is required as a culminating experience. Students work with their advisor and the Department Graduate Coordinator to develop a program of study which supports their thesis topic. A thesis topic would typically be in an area of faculty research interest.

For the most recent, comprehensive list of courses offered by the department, please contact the Department Graduate Coordinator or see the listing at <https://aero.calpoly.edu>.

Program Learning Objectives

1. Competency in advanced mathematics, science, and aerospace engineering knowledge.
2. Ability to apply advanced mathematics, science, and aerospace engineering knowledge to a project that is conducted independently.
3. Make a specific contribution to a field that is relevant to aerospace professionals.
4. Ability to convey effectively engineering ideas and results both orally and in writing.
5. Awareness of professional and ethical responsibility.
6. Awareness of global, contemporary issues related to aerospace engineering and the society at large.
7. Awareness of rapid advancement of modern technology and ability for life-long learning.

MS Aerospace Engineering, Specialization in Research

Characteristics

Emphasizes engineering science and research activity. Graduates have an increased capability for complex research, development, and innovative design, and are prepared for further study in engineering, leading to the Doctor of Engineering or Ph.D. or advanced positions within industry.

Program of Study

A thesis is required as a culminating experience. Students work with their advisor and the Department Graduate Coordinator to develop a program of study which supports their thesis topic. A thesis topic would typically be in an area such as: dynamics and control, fluid dynamics and aerodynamics, multidisciplinary design and optimization, aerospace propulsion, aerospace structures, and systems engineering.

For the most recent, comprehensive list of courses offered by the department, please contact the Department Graduate Coordinator or see the listing at <https://aero.calpoly.edu>.

Blended BS + MS Aerospace Engineering

The blended program provides motivated students with an accelerated route to the MS Aerospace Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

Eligibility

Students majoring in BS Aerospace Engineering may be eligible to pursue the blended program toward the MS Aerospace Engineering. Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 3.0 required. Students are selected by a faculty committee. Please see Graduate Programs (p. 408) for eligibility criteria.

Program of Study

The program allows students to complete a more meaningful capstone experience that integrates the senior design course with the graduate thesis. This arrangement also increases opportunities for industry interaction.

The blended program allows students to double count up to four units of coursework to fulfill the requirements for the BS and MS degrees.

BS Aerospace Engineering

Program Learning Outcomes

ABET-Defined Learning Outcomes

1. An ability to apply knowledge of mathematics, science, and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulate, and solve engineering problems
6. An understanding of professional and ethical responsibility
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. A recognition of the need for, and an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)

- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

AERO 121	Aerospace Fundamentals	2
AERO 215	Introduction to Aerospace Design	2
AERO 220	Aerospace Systems Engineering and Integration	1
AERO 299	Aerospace Thermodynamics	4
AERO 300	Aerospace Engineering Analysis	5
AERO 302	Aerospace Fluid Mechanics	4
AERO 303	Aerospace Gas Dynamics and Heat Transfer	4
AERO 320	Fundamentals of Dynamics and Control	4
AERO 321	Experimental Sensors, Actuators and Control	1
AERO 331	Aerospace Structural Analysis I	4
AERO 431	Aerospace Structural Analysis II	4
AERO 433	Experimental Stress Analysis	1
AERO 460	Aerospace Engineering Professional Preparation	1
AERO 465	Aerospace Systems Senior Laboratory	1
CE 204	Mechanics of Materials I	3
CE 207	Mechanics of Materials II	2
EE 201 & EE 251	Electric Circuit Theory and Electric Circuits Laboratory	4
Concentration Courses ²		41

SUPPORT COURSES

BIO 213	Life Science for Engineers (B2) ¹	2
BMED/BRAE 213	Bioengineering Fundamentals	2
CHEM 124	General Chemistry for Physical Science and Engineering I (B3/B4) ¹	4
ENGL 149	Technical Writing for Engineers (A3) ¹	4
IME 144	Introduction to Design and Manufacturing	4
MATE 210	Materials Engineering	3
MATH 141	Calculus I (B1) ¹	4
MATH 142	Calculus II (B1) ¹	4
MATH 143	Calculus III (Add'l Area B) ¹	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
ME 211	Engineering Statics	3
ME 212	Engineering Dynamics	3
PHYS 131 or PHYS 141	General Physics I (Add'l Area B) ¹	4
PHYS 132	General Physics II	4
PHYS 133	General Physics III	4
STAT 312	Statistical Methods for Engineers (B6) ¹	4

GENERAL EDUCATION (GE)

(See GE program requirements below.) 40

FREE ELECTIVES

Free Electives	0
Total units	189

¹ Required in Support; also satisfies GE

² See Concentrations below

Concentrations (select one)

- Aeronautics (p. 200)
- Astronautics (p. 201)

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		40

¹ Required in Support; also satisfies GE

Aeronautics Concentration

AERO 306	Aerodynamics and Flight Performance	4
AERO 307	Experimental Aerodynamics	2
AERO 401	Propulsion Systems	5
AERO 405	Supersonic and Hypersonic Aerodynamics	4

AERO 420	Aircraft Dynamics and Control	4
AERO 443	Aircraft Design I	4
AERO 444	Aircraft Design II	3
AERO 445	Aircraft Design III	3

Aeronautics Approved Electives.¹

Select from the following: 12

AERO 311	Aircraft Development History	
AERO 351	Introduction to Orbital Mechanics	
AERO 353	Spacecraft Environment	
AERO 360	Creative Problem Solving in Engineering Design ²	
AERO 406	Applied Computational Fluid Dynamics	
AERO 407	Reentry Aerodynamics	
AERO 409	Flight Test	
AERO 421	Spacecraft Attitude Dynamics and Control	
AERO 425	Aircraft Performance	
AERO 432	Advanced Composite Structures Analysis	
AERO 434	Aerospace Structural Analysis III	
AERO 435	Aerospace Numerical Analysis	
AERO 450	Introduction to Aerospace Systems Engineering	
AERO 452	Spaceflight Dynamics II	
AERO 446	Introduction to Space Systems	
AERO 470	Selected Advanced Topics	
AERO 510	Systems Engineering I	
AERO 511	Systems Engineering II	
AERO 512	Aerospace Vehicle Software Application	
AERO 513	Applications of Unmanned Aircraft Systems	
AERO 515	Continuum Mechanics	
AERO 517	Multidisciplinary Design and Optimization	
AERO 519	Fundamentals of Vehicle Dynamics and Control	
AERO 522	Boundary-Layer Theory	
AERO 523	Turbulence	
AERO 525	Computational Fluid Dynamics	
AERO 526	Spacecraft Thermal/Fluid Control	
AERO 528	Laminar Flow Aircraft Development	
AERO 532	Advanced Aerospace Composite Design	
AERO 533	Finite Elements for Aerospace Structural Analysis	
AERO 534	Aerospace Structural Dynamics Analysis	
AERO 535	Advanced Aerospace Structural Analysis	
AERO 540	Elements of Rocket Propulsion	
AERO 541	Air Breathing Propulsion	

AERO 551	Global Positioning Satellite Navigation Systems	
AERO 553	Advanced Control Theory	
AERO 557	Advanced Orbital Mechanics	
AERO 560	Advanced Spacecraft Dynamics and Control	
AERO 561	Vehicle Integration and Testing	
AERO 562	Space Operations	
AERO 565	Advanced Topics in Aircraft Design	
AERO 566	Advanced Topics in Spacecraft Design	
AERO 567	Launch Vehicle and Missile Design	
AERO 568	Aerodynamic Research and Development I	
AERO 569	Aerodynamic Research and Development II	
AERO 570	Selected Advanced Topics ²	
AERO 571	Selected Advanced Topics Laboratory ²	

Total units 41

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of postbaccalaureate studies and/or goals.

² Require a petition.

Astronautics Concentration

AERO 351	Introduction to Orbital Mechanics	4
AERO 353	Spacecraft Environment	4
AERO 354	Space Environment Laboratory	2
AERO 402	Spacecraft Propulsion Systems	5
AERO 421	Spacecraft Attitude Dynamics and Control	4
AERO 446	Introduction to Space Systems	4
AERO 447	Spacecraft Design I	4
AERO 448	Spacecraft Design II	3
AERO 449	Spacecraft Design III	3

Astronautics Approved Electives¹

Select from the following: 8

AERO 306	Aerodynamics and Flight Performance	
AERO 311	Aircraft Development History	
AERO 360	Creative Problem Solving in Engineering Design ²	
AERO 405	Supersonic and Hypersonic Aerodynamics	
AERO 406	Applied Computational Fluid Dynamics	
AERO 407	Reentry Aerodynamics	
AERO 409	Flight Test	
AERO 420	Aircraft Dynamics and Control	
AERO 425	Aircraft Performance	
AERO 432	Advanced Composite Structures Analysis	

AERO 434	Aerospace Structural Analysis III
AERO 435	Aerospace Numerical Analysis
AERO 450	Introduction to Aerospace Systems Engineering
AERO 452	Spaceflight Dynamics II
AERO 470	Selected Advanced Topics
AERO 510	Systems Engineering I
AERO 511	Systems Engineering II
AERO 512	Aerospace Vehicle Software Application
AERO 513	Applications of Unmanned Aircraft Systems
AERO 515	Continuum Mechanics
AERO 517	Multidisciplinary Design and Optimization
AERO 519	Fundamentals of Vehicle Dynamics and Control
AERO 522	Boundary-Layer Theory
AERO 523	Turbulence
AERO 525	Computational Fluid Dynamics
AERO 526	Spacecraft Thermal/Fluid Control
AERO 528	Laminar Flow Aircraft Development
AERO 532	Advanced Aerospace Composite Design
AERO 533	Finite Elements for Aerospace Structural Analysis
AERO 534	Aerospace Structural Dynamics Analysis
AERO 535	Advanced Aerospace Structural Analysis
AERO 540	Elements of Rocket Propulsion
AERO 541	Air Breathing Propulsion
AERO 551	Global Positioning Satellite Navigation Systems
AERO 553	Advanced Control Theory
AERO 557	Advanced Orbital Mechanics
AERO 560	Advanced Spacecraft Dynamics and Control
AERO 561	Vehicle Integration and Testing
AERO 562	Space Operations
AERO 565	Advanced Topics in Aircraft Design
AERO 566	Advanced Topics in Spacecraft Design
AERO 567	Launch Vehicle and Missile Design
AERO 568	Aerodynamic Research and Development I
AERO 569	Aerodynamic Research and Development II
AERO 570	Selected Advanced Topics ²
AERO 571	Selected Advanced Topics Laboratory ²

Total units

41

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals. Only 4 units of 300-level coursework is allowed as an approved elective.

² Require a petition.

Multidisciplinary Design Minor

The minor is not open to Aerospace Engineering majors. Students are admitted by permission of the minor coordinator and are not held to the prerequisites for:

AERO 443 & AERO 444 & AERO 445	Aircraft Design I and Aircraft Design II and Aircraft Design III
AERO 447 & AERO 448 & AERO 449	Spacecraft Design I and Spacecraft Design II and Spacecraft Design III
IME 418	Product-Process Design

Introductory Courses

IME 314	Engineering Economics	3
IME 418	Product-Process Design	4
BUS 382	Organizations, People, and Technology	4
PSY 350	Teamwork	4

Core Courses

AERO 450	Introduction to Aerospace Systems Engineering	4
----------	---	---

Select from the following: 10

AERO 443 & AERO 444 & AERO 445	Aircraft Design I and Aircraft Design II and Aircraft Design III (4, 3, 3)
AERO 447 & AERO 448 & AERO 449	Spacecraft Design I and Spacecraft Design II and Spacecraft Design III (4, 3, 3)

Total units 29

MS Aerospace Engineering, Specialization in Research

Required Courses

MATH 501	Analytic Methods in Applied Mathematics	4
MATH 502 or approved numerical methods elective		4

Advisor Approved Electives

500-level AERO courses		16
400-500 level courses from the College of Engineering or College of Science and Mathematics		12

Culminating Experience

AERO 599	Thesis (Design Project) (2, 2, 5)	9
Total units		45

Biomedical Engineering

Engineering Bldg. (13), Room 260
Phone: 805.756.6400
<https://bmed.calpoly.edu>

College of Engineering Advising Center
Engineering South (40), Room 114
Phone: 805.756.1461

Department Chair: Robert Crockett

Academic Programs

Program name	Program type
Biomedical Engineering	BS, MS

Biomedical Engineering

Biomedical engineering is an interdisciplinary field in which the principles and tools of traditional engineering fields, such as mechanical, materials, electrical, and chemical engineering, are applied to biomedical problems. Engineering plays an increasingly important role in medicine in projects that range from basic research in physiology to advances in biotechnology and the improvement of health care delivery. By its very nature, biomedical engineering is broad and requires a foundation in the engineering sciences as well as in physiology and other biological sciences.

The BS degree program in Biomedical Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org/>.

Undergraduate Program BS Biomedical Engineering

Program Mission and Goals

The mission of the Biomedical Engineering program is to maintain an effective learning environment that enables and empowers graduates for careers of service, leadership and distinction in engineering or other fields. Our approach is to use a participatory, learn-by-doing, "hands-on" laboratory, projects and design centered approach to achieve this end.

To succeed in this mission, the educational objectives of the program are to facilitate graduates to:

1. Utilize a knowledge base with a core foundation in engineering, physical and biological sciences, which will enable them to apply their skills to a variety of challenges in their chosen field. Our graduates will demonstrate innovation, creativity, adaptability, and critical thinking to solve problems in disciplines related to biomedical engineering that are relevant to industry, academia, or medicine, and health related fields.
2. Demonstrate leadership in their chosen fields, and make decisions that are socially and ethically responsible. Our graduates will function effectively in multidisciplinary team environments and communicate effectively to a variety of audiences.
3. Build and expand upon their undergraduate foundations by engaging in learning opportunities throughout their careers.

The program offers a four-year curriculum leading to a B.S. degree. The main educational objectives of the program are to prepare graduates who will excel in the biomedical engineering profession, understand that their education is a continuous enterprise, and seek graduate degrees

for increased flexibility and mobility. The curriculum provides a sound theoretical background, practical engineering knowledge and solid laboratory exposure. It highlights an immediate introduction to the major, strong personal interaction with faculty, strong partnerships with industrial participants and a signature laboratory emphasis.

The application of engineering to medicine and biology underpins a strong and growing segment of the industrial sector, and continues to be an area of inherent interest to students. The need for well educated professionals in this interdisciplinary area has become more acute as the technology being applied has become more sophisticated. Evolution in computing, electronics, signal analysis and mechatronic systems have resulted in dramatic improvements in diagnostic efforts, therapeutic approaches and bioindustrial applications. Studies of biological materials, physiological mechanisms, biochemical kinetics and heat and mass transport in biological systems require engineering expertise. With the advent of research into artificial organs, prosthetic devices and tissue engineering, applied medical research and applied biological research has taken on a distinct engineering aspect.

Biomedical engineering combines engineering expertise with medical needs for the enhancement of health care. It is a branch of engineering in which knowledge and skills are developed and applied to define and solve problems in biology and medicine. Students choose the biomedical engineering field to be of service to people; for the excitement of working with living systems; and to apply advanced technology to the complex problems of medical care.

Some well established specialty areas exist within the field of biomedical engineering: *bioinstrumentation*, *biomechanics*, *biomaterials*, *systems physiology*, *tissue engineering*, *clinical engineering*, and *rehabilitation engineering*.

Bioinstrumentation is the application of electronics and measurement principles and techniques to develop devices used in diagnosis and treatment of disease. Computers are becoming increasingly important in bioinstrumentation, from the microprocessor used to do a variety of small tasks in a single purpose instrument to the extensive computing power needed to process the large amount of information in a medical imaging system. *Biomechanics* is mechanics applied to biological or medical problems. It includes the study of motion, of material deformation, of flow within the body and in devices, and transport of chemical constituents across biological and synthetic media and membranes. *Biomaterials* describes both living tissue and materials used for implantation. Understanding the properties of the living material is vital in the design of implant materials. *Systems physiology* is the term used to describe that aspect of biomedical engineering in which engineering strategies, techniques and tools are used to gain a comprehensive and integrated understanding of the function of living organisms ranging from bacteria to humans. *Tissue engineering* is a rapidly developing field that combines engineered materials with living cells to restore or replace lost organ function. *Clinical engineering* is the application of technology for health care in hospitals. The clinical engineer is a member of the health care team along with physicians, nurses and other hospital staff. *Rehabilitation engineering* is a new and growing specialty area of biomedical engineering. Rehabilitation engineers expand capabilities and improve the quality of life for individuals with physical impairments.

In addition to the objectives for all engineering programs, the goal of the BS program in Biomedical Engineering is the preparation of engineering professionals who have: (1) an understanding of biology and physiology; (2) an ability to apply advanced mathematics to problems at the interface of engineering and biology; (3) an ability to measure and interpret

data from living systems; and (4) an ability to address the problems associated with the interaction between living and nonliving systems.

Concentrations

Bioinstrumentation

The bioinstrumentation concentration prepares students for entry level jobs in the biomedical devices industry where a deeper understanding of electrical engineering skills are necessary.

Mechanical Design

The mechanical design concentration prepares students for employment in the product development, design, or manufacturing fields in the biomedical device industry.

General Curriculum in Biomedical Engineering

A General Curriculum in Biomedical Engineering is also an option. It is not a formal concentration. Students are encouraged to select from one of the concentrations listed above, but those who do not declare a concentration will default to the General Curriculum.

Graduate Programs

MS Biomedical Engineering

General Characteristics

The Master of Science degree program in Biomedical Engineering is well-suited for those individuals who desire depth in engineering application to living systems, with a strong pragmatic and rigorous, hands-on educational experience. Graduates will be well-equipped to make significant contributions to the biomedical field. The MS in Biomedical Engineering program objectives are to:

- Provide graduates with a rigorous, broad-based advanced education in engineering coupled with applied biology that will prepare graduates for the many diverse career opportunities of biomedical engineering.
- Provide an empowering professional degree for students who intend to become practicing engineers
- Provide job-entry education for the more complex and evolving interdisciplinary area of biomedical engineering.
- Provide a base that enables graduates to maintain currency in their fields.
- Provide preparation for further study in engineering and/or medicine, leading to the Doctor of Engineering, MD, Ph.D, or MD/Ph.D. degrees.

Prerequisites

For admission as a classified graduate student, an applicant must possess a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit scores for the General Test of the Graduate Record Examination. Applicants are also required to submit 3 letters of reference in support of their application. A college level biology course, with laboratory, for biology majors is highly recommended. Applicants who meet these standards but lack prerequisite coursework may be admitted as conditionally classified students and must make up any deficiencies before advancement to candidacy. Applicants from other academic disciplines, such as biology or chemistry are encouraged to apply and may be admitted to the program conditionally in order to make up deficiencies in prerequisite coursework. Information regarding specific

admission requirements and classification as a graduate student may be obtained from the Graduate Coordinator, Biomedical Engineering.

Program of Study

Graduate students must file formal study plans with their advisor, department, college, and university graduate studies office as well as fulfill the Graduation Writing Requirement no later than the end of the quarter in which the 12th unit of approved graduate course work is completed. The formal program of study must include a minimum of 45 units with:

1. At least 23 units of the 45 unit program at the 500 level.
2. A thesis or project as the mandatory culminating experience.

MS Biomedical Engineering, Specialization in Regenerative Medicine Characteristics

Prepares students for careers in regenerative medicine and related fields. Specifically, our graduates are prepared for immediate employment in regenerative medicine, biotechnology, or medical technology companies, as well as research specialists/laboratory managers at universities or research institutes. Program graduates are also well-prepared to matriculate into bioengineering doctoral programs or graduate programs in the health professions.

Culminating Experience

Students who obtain a degree in the Master of Science in Biomedical Engineering with a specialization in Regenerative Medicine are not required to complete a "thesis" through BMED 599. In place of the thesis as a culminating experience, students are required to complete a non-traditional Comprehensive Exam. This non-traditional Comprehensive Exam includes a 9-month internship at a company or research laboratory¹ (ASCI/BIO/BMED 593), a quarter-long project course at Cal Poly (ASCI/BIO/BMED 594), a written report and oral presentation of the internship project, and a written report and oral presentation of the quarter-long project course. Through the completion of these components, students demonstrate their "ability to integrate the knowledge of the area, show critical and independent thinking, and demonstrate mastery of the subject matter."

¹Students will complete their internship at one of our partner institutions. An updated list of our current partners can be found on our program website.

BS Biomedical Engineering Program Learning Outcomes

1. An ability to apply knowledge of mathematics, science, and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulate, and solve engineering problems
6. An understanding of professional and ethical responsibility

7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. A recognition of the need for, and an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

In addition to these objectives, the program prepares graduates to have:

- An understanding of biology and physiology
- The capability to apply advanced mathematics (including differential equations and statistics), science, and engineering to solve the problems at the interface of engineering and biology
- The ability to make measurements on and interpret data from living systems
- The capability to address the problems associated with the interaction between living and non-living materials and systems.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

BMED 101	Introduction to the Biomedical Engineering Major	1
BMED 102	Introduction to Biomedical Engineering Analysis	1
BMED 212	Introduction to Biomedical Engineering Design	3
BMED 310	Biomedical Engineering Measurement and Analysis	4
BMED 410	Biomechanics	4
BMED 420	Principles of Biomaterials Design	4
BMED 425	Biomedical Engineering Transport	4
BMED 430	Biomedical Modeling and Simulation	2
BMED 440	Bioelectronics and Instrumentation	4
BMED 450	Contemporary Issues in Biomedical Engineering	4
or ENGR 451	Special Topics in Bioengineering	
BMED 455	Biomedical Engineering Design I ²	4
BMED 456	Biomedical Engineering Design II: Senior Project ²	4
BMED 460	Engineering Physiology	4
General Curriculum in BS Biomedical Engineering or Concentration		28-33

SUPPORT COURSES

BIO 161	Introduction to Cell and Molecular Biology (B2/B4) ¹	4
BIO 231 or BIO 232	Human Anatomy and Physiology I Human Anatomy and Physiology II	5
CE 204	Mechanics of Materials I	3
CHEM 124 & CHEM 125	General Chemistry for Physical Science and Engineering I and General Chemistry for Physical Science and Engineering II (B3/B4) ¹	8
CSC 231	Programming for Engineering Students	2
EE 201	Electric Circuit Theory	3
ENGL 149	Technical Writing for Engineers (A3) ¹	4
MATE 210	Materials Engineering	3
MATH 141 & MATH 142	Calculus I and Calculus II (B1) ¹	8
MATH 143	Calculus III (Add'l Area B) ¹	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
ME 211	Engineering Statics	3
ME 212	Engineering Dynamics	3
ME 302	Thermodynamics I	3
ME 341	Fluid Mechanics I	3
PHYS 141	General Physics IA (Add'l Area B)	4
PHYS 132	General Physics II	4
PHYS 133	General Physics III	4
STAT 312	Statistical Methods for Engineers (B6) ¹	4

GENERAL EDUCATION (GE)

(See GE program requirements below.) 40

FREE ELECTIVES

Free Electives	0
Total units	191-196

¹ Required in Support; also satisfies GE.

² ENGR 459, ENGR 460, ENGR 461 and BMED 400 (8); or ENGR 463, ENGR 464, ENGR 465, and BMED 400 (8) may substitute for BMED 455 and BMED 456 (8).

General Curriculum in BS Biomedical Engineering or Concentrations

- General Curriculum (p. 206)
- Bioinstrumentation (p. 206)
- Mechanical Design (p. 207)

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4

A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B Science and Mathematics		
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C Arts and Humanities		
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E Society and the Individual		
D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		40

¹ Required in Support; also satisfies GE.

General Curriculum in Biomedical Engineering

This is the default curriculum required for students who do not declare a concentration.

CE 207 or EE 321	Mechanics of Materials II Electronics	2-3
ME 228	Engineering Design Communication	2
Approved Technical Electives		12
BMED 355	Electrical Engineering Concepts for Biomedical Engineering	
BMED/CE/ME 404	Applied Finite Element Analysis	
BMED 432	Micro/Nano System Design	
BMED 434/ MATE 430	Micro/Nano Fabrication	
BMED 435	Microfabrication Laboratory	
BMED 436	Characterization of Micro/Nano Scale Structures	
BMED 445	Biopotential Instrumentation	
BMED 459	Senior Thesis	
BMED 510	Principles of Tissue Engineering	
BMED 515	Introduction to Biomedical Imaging	
BMED 525	Skeletal Tissue Mechanics	
BMED/MATE 530	Biomaterials	

BMED 550	Current and Evolving Topics in Biomedical Engineering	
IME 420	Simulation	
IME 430	Quality Engineering	
IME 435	Reliability for Design and Testing	
IME 527	Design of Experiments	
MATE 380	Thermodynamics and Physical Chemistry	
MATE 401	Materials Characterization Techniques	
MATE 410	Nanoscale Engineering	
MATE 425	Corrosion Engineering	
MATE/CHEM 446	Surface Chemistry of Materials	
ME 305	Introduction to Mechatronics	
ME 326	Intermediate Dynamics	
Approved Support Electives		12
BIO 232	Human Anatomy and Physiology II	
BIO 302	Human Genetics	
BIO 303	Survey of Genetics	
BIO 351	Principles of Genetics	
BIO/CHEM 441	Bioinformatics Applications	
BIO 452	Cell Biology	
BUS 310	Introduction to Entrepreneurship	
CHEM 312	Survey of Organic Chemistry	
CHEM 313	Survey of Biochemistry and Biotechnology	
IME 327	Test Design and Analysis in Manufacturing Engineering	
MATE 215	Materials Laboratory I	
MATE 222	Materials Selection Life Cycle	
MATH 344	Linear Analysis II	
MCRO 224	General Microbiology I	
Total units		28-29

Bioinstrumentation Concentration

BMED 355	Electrical Engineering Concepts for Biomedical Engineering	4
BMED 445	Biopotential Instrumentation	4
EE 228	Continuous-Time Signals and Systems	4
EE 251	Electric Circuits Laboratory	1
EE/CPE 328	Discrete Time Signals and Systems	3
EE/CPE 368	Signals and Systems Laboratory	1
IME 156	Basic Electronics Manufacturing	2
MATH 344	Linear Analysis II	4
Approved Technical Electives		
Select from the following:		4-5
BMED 515	Introduction to Biomedical Imaging	
BMED 555	Neural Systems Simulation and Modeling	
EE 302 & EE 342	Classical Control Systems and Classical Control Systems Laboratory	

EE 335 & EE 375	Electromagnetic Fields and Transmission and Electromagnetic Fields and Transmission Laboratory	
--------------------	--	--

Approved Support Electives

Select from the following: 4-5

BIO 232	Human Anatomy and Physiology II	
BIO 302	Human Genetics	
BIO 303	Survey of Genetics	
BIO/CHEM 441	Bioinformatics Applications	
CHEM 312	Survey of Organic Chemistry	

Total units 31-33

Mechanical Design Concentration

BMED 330	Intermediate Biomedical Design	4
CE 207	Mechanics of Materials II	2
IME 141	Manufacturing Processes: Net Shape	1
MATH 344	Linear Analysis II	4
ME 228	Engineering Design Communication	2
ME 251	Introduction to Detailed Design with Solid Modeling	2
ME 328	Design for Strength and Stiffness	4

Approved Technical Electives

Select from the following: 7-8

BMED/CE/ME 404	Applied Finite Element Analysis	
BMED 525	Skeletal Tissue Mechanics	
IME 418	Product-Process Design	
IME 430	Quality Engineering	
IME 435	Reliability for Design and Testing	
IME 527	Design of Experiments	
ME 318	Mechanical Vibrations	
ME 326	Intermediate Dynamics	
ME 401	Stress Analysis	
ME 402	Orthopedic Biomechanics	
ME 410	Experimental Methods in Mechanical Design I	
ME 412	Composite Materials Analysis and Design	

Approved Support Electives

Select from the following: 3-5

BIO 232	Human Anatomy and Physiology II	
BIO 302	Human Genetics	
BIO 303	Survey of Genetics	
CHEM 312	Survey of Organic Chemistry	
CHEM/MATE 446	Surface Chemistry of Materials	

Total units 29-32

MS Biomedical Engineering

Required Courses

BMED 460	Engineering Physiology ¹	4
BMED 530	Biomaterials	4

BMED 550	Current and Evolving Topics in Biomedical Engineering	4
BMED 563	Biomedical Engineering Graduate Seminar	2
BMED 599	Design Project (Thesis) ²	9

Approved Engineering, Science and Mathematics Electives

A minimum of 8 units from an advisor approved list of mathematics, statistics, biology, or analytic engineering courses, with at least 4 units at the 500 level. Typical courses could be, but are not limited to:

BMED 404	Applied Finite Element Analysis	
CSC 448	Bioinformatics Algorithms	
IME 503	Applied Statistical Methods in Engineering	
MATH 418	Partial Differential Equations	
MATH 501	Analytic Methods in Applied Mathematics	
MATH 502	Numerical Methods in Applied Mathematics	
STAT 513	Applied Experimental Design and Regression Models	

Remaining elective units are advisor approved. ³

Total units 45

¹ BMED 460 is not required for BMED undergraduates as it is a core course in the major.

² BMED 591 and/or BMED 592 can substitute for up to 4 units of thesis. Recommended for BMED BS 4+1 students.

³ BMED 520 is required for non-BMED undergraduate majors.

MS Biomedical Engineering, Specialization in Regenerative Medicine

Required Courses

ASCI 581	Graduate Seminar in Animal Science	1
ASCI/BIO/BMED 593	Regenerative Medicine Internship	10
ASCI/BIO/BMED 594	Applications in Regenerative Medicine	2
BIO/CHEM 475 or ASCI 403	Molecular Biology Laboratory Applied Biotechnology in Animal Science	3-5
BIO 534	Principles of Stem Cell Biology	2
BIO 590	Seminar in Biology	1
BMED 460	Engineering Physiology	4
BMED 510	Principles of Tissue Engineering	4
BMED 515	Introduction to Biomedical Imaging	4
BMED 560	Cell Transplantation and Biotherapeutics	2
BMED 561	Cell Transplantation and Biotherapeutics Laboratory	2
BMED 563	Biomedical Engineering Graduate Seminar	2

Approved Electives

Approved engineering, science and mathematics electives, including BMED 500 ¹	6-8
Total units	45

¹ The range of elective units reflects differences in the Molecular Techniques Course options (BIO 475; ASCI 403) and inclusion of Individual Study, such that the total required units for the program are 45.

Civil & Environmental Engineering

Engineering Bldg. (13), Room 266

Phone: 805.756.2947

Email: ceenve@calpoly.edu

<https://ceenve.calpoly.edu>

Department Chair: Charles Chadwell

College of Engineering Advising Center

Engineering South (40), Room 111

Phone: 805.756.1461

Academic Programs

Program name	Program type
Civil Engineering	BS
Environmental Engineering	BS
Civil and Environmental Engineering	MS

The Civil and Environmental Engineering Department at Cal Poly, San Luis Obispo offers a rigorous and engaging educational experience that fully embraces Cal Poly's "Learn by Doing" approach.

Undergraduate Programs

BS Civil Engineering

Graduates of a civil engineering program must have the engineering skills needed to plan, design, construct, and maintain infrastructure and industrial facilities. In addition, graduates must have the broad education necessary to communicate effectively with other engineers, architects, planners, administrators, government officials, and the general public. The faculty and staff of the Civil Engineering program at Cal Poly understand these needs and take pride in preparing their students for the challenges associated with engineering practice.

The Civil Engineering program at Cal Poly has quickly grown into one of the largest and most respected programs in California and the nation. The program consistently attracts top student candidates because of its modern, well-equipped laboratories, the close interaction that occurs between undergraduates and full-time faculty, and a strong reputation among employers in the civil engineering and construction industries. Scientific depth is included within the curriculum for those students who are interested in graduate study.

The Civil Engineering program recognizes the importance of student organizations and strongly supports the American Society of Civil Engineers (ASCE) Student Chapter as well as Chi Epsilon, the national civil engineering honor society. These student groups sponsor opportunities for professional development, community service, and social activities which help to complement the formal academic program. The ASCE Student Chapter, an active member of the campus community, has been recognized as the nation's most outstanding civil engineering student organization twice during the past decade.

The Civil Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>. The program's mission is to prepare students for successful careers in civil engineering by providing a high quality, practice-oriented education that emphasizes design project experiences, "hands-on" laboratory activities, and teamwork. The program's faculty, in consultation with civil engineering practitioners and alumni, have developed a number of educational objectives to support this mission. These objectives are:

1. Successfully perform engineering functions in Civil Engineering practice;
2. Communicate effectively with industry professionals, decision makers and community members;
3. Work in an ethical and professional manner to positively impact society and the environment in a regional, national and global context;
4. Pursue life-long learning and service to the profession through continuing education opportunities, professional organizations, leadership, graduate degrees and/or other certification; and
5. Progress toward professional licensure.

The undergraduate curriculum in civil engineering is designed to support the educational objectives. Therefore, the curriculum includes broad coverage of mathematics, engineering and basic sciences, liberal arts, humanities, and social sciences. The program also includes a number of required engineering courses designed to ensure students become proficient in a breadth of civil engineering sub-disciplines: geotechnical, construction, structural, transportation, environmental, and water resources.

All CE majors must complete a quarter course in professional practice and a two quarter senior design capstone sequence that focuses on current civil engineering design procedures, standards and multiple realistic constraints. The professional practice course includes topics on interpersonal communication, teamwork, leadership, and ethics. Together, the three quarters promote an understanding of the issues and skills to become a successful design professional.

Flexibility within the curriculum allows students to select from a wide range of upper division civil engineering technical electives. Students use these technical electives to focus in one of the four areas of civil engineering noted above or to design a "general" curriculum that allows for a broad range of civil engineering interests. Students should consult with a faculty advisor prior to selecting and enrolling in upper division civil engineering technical electives.

BS Environmental Engineering

The BS program in Environmental Engineering is concerned with the interrelation of people, materials, and processes in a complex and changing environment. The broad field of environmental engineering includes control of air and water pollution, environmental health and safety, solid waste, hazardous waste management, and pollution prevention.

The program offers a sound background in the fundamentals of thermodynamics, fluid mechanics, mass transfer, water resources, and geotechnical engineering. The problem-oriented approach to instruction, in modern well-equipped laboratories, provides an excellent opportunity to gain understanding and experience of the discipline. The program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

The main focus of the program is to prepare graduates for practice in professional engineering. Thus, Cal Poly's "learn by doing" philosophy is emphasized by integrating design throughout the curriculum, especially in the numerous design-centered laboratories. In the required senior design project, which is completed in a two-quarter set of capstone courses, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

The Environmental Engineering program educational objectives are that its graduates will:

- Apply environmental engineering principles to analyze and solve real-world engineering challenges.
- Think independently, engage in life-long learning, and continue their development as professionals.
- Be prepared to pursue graduate study and licensure.
- Communicate effectively, both orally and in writing, and collaborate successfully in teams.
- Address the ethical, societal, and global issues encountered in environmental engineering.

An engineering approach to the subject enables graduates of the program to pursue careers in industry, consulting firms, and public agencies concerned with air and water pollution control, groundwater, potable water treatment, solid waste management, and hazardous waste management.

Various program constituencies, such as graduates and employers, are consulted periodically for input on the appropriateness as well as the attainment of the educational objectives. Other indicators such as student/alumni placement and success rates in the statewide fundamentals in engineering examination are also used to evaluate attainment.

The Society of Environmental Engineers offers technical programs and other activities, including field trips to study typical installations of systems. Student memberships also are available in the Air and Waste Management Association, the California Water Pollution Control Association, and the Water Environment Federation.

Graduate Program

MS Civil and Environmental Engineering

General Characteristics

The Master of Science program in Civil and Environmental Engineering has the following objectives:

- Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and managerial engineering;
- Updating opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree.

Prerequisites

For admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering or a closely related physical science with a minimum GPA of 3.0 in the last 90 quarter units (60 semester) attempted. Applicants are required to submit satisfactory scores for the General (Aptitude) Test of the Graduate Record Examination. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make-up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Program Coordinator of the MS in Civil and Environmental Engineering program.

Program of Study

Graduate students must file a formal study plan with their advisor, department, college and university graduate studies office by no later than the end of the quarter in which the 12th unit of approved courses is completed. The formal program of study must include a minimum of 45 units (at least 23 of which must be at the 500 level). With the graduate advisor's approval, students select their elective units in one of the following areas of study: geotechnical engineering, structural engineering, transportation and planning, or water resources and environmental engineering.

The broad curriculum requirements for the MS in Civil and Environmental Engineering are:

- a minimum of 45 total units;
- 2 units of Graduate Seminar (CE 591 and CE 592)
- a minimum of 20 units of advisor approved electives within the major;
- a minimum of 8 units of advisor-approved electives outside the primary area of focus;
- at least 23 units of the 45 unit program at the 500 level;
- a comprehensive examination (non-thesis option) or a written thesis with oral defense (thesis option).

Two program options are available:

Thesis option

36 units of advisor-approved coursework and 9 units of research/design resulting in a written thesis and oral defense examination administered by a panel of at least three faculty.

Non-thesis option

45 units of advisor-approved coursework which includes 1-unit comprehensive examination consisting of written and oral components administered by a panel of three faculty (maximum of two opportunities to pass this examination). Not an option for the blended BS +MS program.

Blended BS + MS Civil and Environmental Engineering

The blended program provides motivated students with an accelerated route to an MS in Civil and Environmental Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

Eligibility

Students majoring in BS Civil Engineering or BS Environmental Engineering may be eligible to pursue the blended program toward an MS in Civil and Environmental Engineering after completing all required support and CE/ENVE 300-level classes. Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 3.0. Please see Graduate Programs (p. 412) for additional eligibility criteria.

Program of Study

Students originating in the BS Civil and Environmental Engineering programs are required to take:

Select one of the following Series:

Series A		
CE 466	Senior Design Project I	
CE 467	Senior Design Project II	
Series B		
CE 468	Community Engineering Senior Design Project I	
CE 469	Community Engineering Senior Design Project II	
Series C		
ENVE 466	Senior Project Design Laboratory I	
ENVE 467	Senior Project Design Laboratory II	
CE 599	Design Project (Thesis)	9
or ENVE 599	Design Project (Thesis)	

The blended program allows students to earn graduate credit for several of their senior electives, effectively decreasing the summed unit requirements for both degrees. Students in the blended program are required to complete a thesis.

BS Civil Engineering

Program Learning Outcomes

1. An ability to apply knowledge of mathematics, science, and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulate, and solve engineering problems
6. An understanding of professional and ethical responsibility
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. A recognition of the need for, and an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism

No major or support courses may be selected as credit/no credit.

MAJOR COURSES

CE 111	Introduction to Civil Engineering	1
--------	-----------------------------------	---

CE 112	Design Principles in Civil Engineering	2
CE 113	Computer Aided Drafting in Civil Engineering	2
CE 204	Mechanics of Materials I	3
CE 207	Mechanics of Materials II	2
CE 251	Programming Applications in Engineering	2
CE 259	Civil Engineering Materials	2
CE 321 & CE 322	Fundamentals of Transportation Engineering and Fundamentals of Transportation Engineering Laboratory	5
CE 336 & CE 337	Water Resources Engineering and Hydraulics Laboratory	5
CE 352	Structural Engineering	4
CE 355	Reinforced Concrete Design	4
CE 381 & CE 382	Geotechnical Engineering and Geotechnical Engineering Laboratory	5
CE 465	Civil Engineering Professional Practice	1
Select from the following:		6

CE 466 & CE 467	Senior Design Project I and Senior Design Project II	
CE 468 & CE 469	Community Engineering Senior Design Project I and Community Engineering Senior Design Project II	
Technical Electives ^{2,3}		24

In consultation with faculty advisor, select from CE 356, CE 371 or CM 371, ENVE 325, any 400-500 level CE and ENVE courses not required in the major (maximum of 4 units from the following list):

Select a maximum of 4 units from the following:		
ARCE 305	Masonry Design	
ARCE 372	Steel Structures Design Laboratory	
ARCE 403	Advanced Steel Structures Laboratory	
BIO/NR/SS 421	Wetlands	
BMED/CE/ME 404	Applied Finite Element Analysis	
BRAE 345	Aerial Photogrammetry and Remote Sensing	
BRAE 447	Advanced Surveying with GIS Applications	
BRAE 532	Water Wells and Pumps	
CHEM 341	Environmental Chemistry: Water Pollution	
CM 334	Construction Law	
CM 432	Design-Build Project Management	
CRP 420	Land Use Law	
CRP 435	Transportation Theory	
CRP/NR 404	Environmental Law	
CRP/NR 408	Water Resource Law and Policy	
ERSC/GEOL 401	Field-Geology Methods	

ERSC/GEOL 402	Geologic Mapping	
GEOL 415	Structural Geology	
IME 314	Engineering Economics	
MATE 425	Corrosion Engineering	
MATE 450	Fracture and Failure Analysis	
MATH 344	Linear Analysis II	
SS 423	Environmental Soil and Water Chemistry	
SS 442	Vadose Zone and Groundwater Processes	
SUPPORT COURSES		
BIO 213	Life Science for Engineers (B2) ¹	2
BMED/BRAE 213	Bioengineering Fundamentals (B2) ¹	2
BRAE 239	Engineering Surveying	4
CHEM 124	General Chemistry for Physical Science and Engineering I (B3/B4) ¹	4
CHEM 125	General Chemistry for Physical Science and Engineering II	4
ENGL 149	Technical Writing for Engineers (A3) ¹	4
ENVE 331	Introduction to Environmental Engineering	4
GEOL 201	Physical Geology	3
MATE 210	Materials Engineering	3
MATE 215	Materials Laboratory I	1
MATH 141	Calculus I (B1) ¹	4
MATH 142	Calculus II (B1) ¹	4
MATH 143	Calculus III (Add'l Area B) ¹	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
ME 211	Engineering Statics	3
ME 212	Engineering Dynamics	3
ME 302	Thermodynamics I	3
or CE 371	Construction Management and Project Planning	
ME 341	Fluid Mechanics I	3
PHYS 141	General Physics IA (Add'l Area B) ¹	4
PHYS 132 & PHYS 133	General Physics II and General Physics III	8
STAT 312	Statistical Methods for Engineers (B6) ¹	4
Approved Engineering Science Elective ^{2,4}		
Select from the following:		2-4
CM 280	Building Information Modeling	
CSC 231	Programming for Engineering Students	
CSC 234	C and Unix	
EE 201	Electric Circuit Theory	
IME 314	Engineering Economics	
MATH 304	Vector Analysis	
MATH 344	Linear Analysis II	
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		40
FREE ELECTIVES		

Free Electives	0
Total units	189-191

- ¹ Required in Support; also satisfies GE
- ² Consultation with advisor is recommended prior to selecting technical electives or approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
- ³ Additional guidelines for technical electives:
 1. More than 4 units of coursework outside CE/ENVE is only permitted in special/ unusual cases and requires written justification by the student, and approval by the Department Chair.
 2. No more than 4 combined units of CE 400, CE 500 and ENVE 400, ENVE 500 can count towards the degree.
 3. No more than 8 combined units of CE 470 / ENVE 470, CE 471 / ENVE 471, CE 570 / ENVE 570, CE 571 / ENVE 571 can be credited.
 4. Co-op, graduate seminar, senior project/design, and thesis courses are not permitted.
 5. Only one course can be credited for CE 458 / CE 558; CE 459 / CE 556.
- ⁴ The courses selected to satisfy this requirement may not be used to satisfy other major, support, or general education requirements (no double counting of coursework).

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		40

¹ Required in Support; also satisfies GE

BS Environmental Engineering

Program Learning Outcomes

1. An ability to apply knowledge of mathematics, science, and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulate, and solve engineering problems
6. An understanding of professional and ethical responsibility
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. A recognition of the need for, and an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

CE 113	Computer Aided Drafting in Civil Engineering	2
CE 204	Mechanics of Materials I	3
CE 207	Mechanics of Materials II	2
CE 251	Programming Applications in Engineering	2
CE 336	Water Resources Engineering	4
CE 337	Hydraulics Laboratory	1
CE 381	Geotechnical Engineering	4
CE 434	Groundwater Hydraulics and Hydrology	4
CE 465	Civil Engineering Professional Practice	1
ENVE 111	Introduction to the Environmental Engineering Profession	1
ENVE 264	Environmental Fluid Mechanics	4
ENVE 304	Process Thermodynamics	3

ENVE 309	Noise and Vibration Control	3
ENVE 325	Air Quality Engineering	4
ENVE 331	Introduction to Environmental Engineering	4
ENVE 421	Mass Transfer Operations	4
ENVE 426	Air Quality Measurements	3
ENVE 434	Water Chemistry and Water Quality Measurements	4
ENVE 438	Water and Wastewater Treatment Design	3
ENVE 450	Industrial Pollution Prevention	4
ENVE 466 & ENVE 467	Senior Project Design Laboratory I and Senior Project Design Laboratory II	4

Select from the following: 12

ENVE 411	Air Pollution Control	
ENVE 436	Introduction to Hazardous Waste Management	
ENVE 439	Sustainable Solid Waste Engineering	
ENVE 443	Bioremediation Engineering	
ENVE 455	Environmental Health and Safety	
ENVE 480	Environmental Engineering of Energy	

Technical Electives ^{1,2} 10

Select from the technical electives list below

SUPPORT COURSES		
CHEM 124	General Chemistry for Physical Science and Engineering I (B3 & B4) ³	4
CHEM 125	General Chemistry for Physical Science and Engineering II	4
CHEM 126	General Chemistry for Physical Science and Engineering III	4
CHEM 312	Survey of Organic Chemistry (trans equiv CHEM 212)	5
ENGL 149	Technical Writing for Engineers (A3) ³	4
MATH 141	Calculus I (B1) ³	4
MATH 142	Calculus II (B1) ³	4
MATH 143	Calculus III (Add'l Area B) ³	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
MCRO 221	Microbiology (B2) ³	4-5
or MCRO 224	General Microbiology I	
ME 211	Engineering Statics	3
PHYS 141	General Physics IA (Add'l Area B) ³	4
PHYS 132	General Physics II	4
PHYS 133	General Physics III	4
STAT 312	Statistical Methods for Engineers (B6) ³	4

GENERAL EDUCATION (GE)

(See GE program requirements below.) 40

FREE ELECTIVES

Free Electives	0
Total units	190-191

¹ To be selected in consultation with your academic advisor.

² A student may petition to take a course not included in the list of electives and receive major technical elective credit, but they must first obtain approval from a faculty advisor, before taking the course.

³ Required in Support; also satisfies GE.

Technical Electives

Technical Electives may be chosen from any 300-500 level CE/ENVE courses not taken to satisfy other curriculum requirements, with the following exceptions: senior project, co-op, graduate seminar, comprehensive exam, and thesis; and ENVE 324, ENVE 323, ENVE 570, ENVE 571.

Technical Electives cannot be used to satisfy other major, support, or general education requirements. No double counting is allowed.

No more than 4 units in total from CE 400/ENVE 400, CE 500/ENVE 500, ENVE 405, ENVE 407, and ENVE 471 combined can be counted towards technical electives.

No more than 4 units of coursework other than CE/ENVE may be used to satisfy the ENVE Engineering technical elective degree requirement.

Air Quality and Climate

ERSC/GEOG 414	Global and Regional Climatology
PHYS 313	Introduction to Atmospheric Physics

Appropriate Technology

PSC/UNIV 492	Appropriate Technology for the World's People: Design
--------------	---

Biology/Biochemistry/Microbiology

BIO 401	Principles of Conservation Biology
ENGR/ENVE 581	Biochemical Engineering
MCRO 342	Public Health Microbiology
MSCI 307	World Aquaculture: Applications, Methodologies and Trends

Computer Applications and Computations

LA/NR 317	The World of Spatial Data and Geographic Information Technology
STAT 313	Applied Experimental Design and Regression Models
STAT 323	Design and Analysis of Experiments I

Chemistry

CHEM 313	Survey of Biochemistry and Biotechnology
CHEM 341	Environmental Chemistry: Water Pollution
CHEM 350	Chemical Safety

Energy

BRAE 448	Bioconversion
PHYS 310	Physics of Energy

Hydrology and Soils

BRAE 532	Water Wells and Pumps
----------	-----------------------

Law and Policy

CRP/NR 404	Environmental Law
CRP/NR 408	Water Resource Law and Policy
IME 314	Engineering Economics

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective (PHIL 340 or NR 360 recommended)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		40

¹ Required in Support; also satisfies GE

MS Civil and Environmental Engineering

Program Learning Objectives

1. Apply and synthesize technical knowledge to solve solutions to advanced Civil and Environmental Engineering problems in a chosen subject area of mastery (Environmental, Geotechnical, Structural, Water Resources, or Transportation Engineering).
2. Demonstrate the ability for lifelong learning necessary for the constantly evolving nature of engineering design and practice.
3. Effectively communicate technical information orally and in writing.
4. Demonstrate independent thinking and decision making skills.
5. Integrate ethical and professional components into the solutions of complex engineering problems.
6. Evaluate engineering systems for sustainable performance and create solutions to encompass a project's full lifecycle.

Required Courses

CE 591	Graduate Seminar I	1
CE 592	Graduate Seminar II	1
Select one of the following options:		9
CE/ENVE 599	Design Project (Thesis)	
Or 9 units of advisor approved analysis and design electives within the major (nonthesis option)		
Advisor approved analysis and design electives within a specific area of focus		
Select from the following: ¹		20-26
CE 400	Special Problems ²	
CE 401	Advanced Mechanics of Materials	
CE 405	Concrete Materials	
CE 407	Structural Dynamics	
CE 421	Traffic Engineering	
CE 422	Highway Geometrics and Design	
CE 423	Intelligent Transportation Systems	
CE 424	Public Transportation	
CE 431	Coastal Hydraulics I	
CE 432	Coastal Hydraulics II	
CE 433	Open Channel Hydraulics	
CE 434	Groundwater Hydraulics and Hydrology	
CE 440	Hydraulic Systems Engineering	
CE 454	Structural Design	
CE 455	Design of Timber Structures	
CE 456	Seismic Principles for Civil and Environmental Engineering	
CE 457	Bridge Engineering	
CE 458	Fiber Reinforced Polymer (FRP) Design	
CE 459	FRP Strengthening of Reinforced Concrete Structures	
CE 475	Civil Infrastructure and Building Systems	
CE 481	Analysis and Design of Shallow Foundations	
CE 486	Introduction to Geological Engineering	
CE 487	Design of Foundations and Slopes in Rock	
CE 488	Engineering Risk Analysis	
CE 500	Individual Study ²	
CE 501	Advanced Matrix Analysis of Structures I	
CE 504	Finite Element Analysis	
CE 521	Highway Pavement Designs	
CE 523	Transportation Systems Planning	
CE 525	Airport Planning and Design	
CE 527	Sustainable Mobility	
CE 528	Transportation Economics and Analysis	
CE 529	Modeling and Simulation in Transportation	

CE 533	Advanced Water Resources Engineering
CE 535	Water Resources Systems Planning and Analysis
CE 537	Groundwater Contamination
CE 539	Environmental Hydraulics
CE 552	Analysis and Seismic Design of Reinforced Concrete
CE 553	Ductile Design of Steel Structures
CE 555	Advanced Civil Engineering Materials Laboratory
CE 557	Seismic Analysis and Design for Civil Engineers
CE 559	Prestressed Concrete Design
CE 571	Selected Advanced Laboratory
CE 581	Advanced Geotechnical Engineering
CE 583	Geotechnical Earthquake Engineering
CE 584	Lateral Support Systems
CE 585	Slope Stability Analysis
CE 586	Analysis and Design of Deep Foundations
CE 588	Ground Improvement
CE 589	Geosynthetics Engineering
ENVE 400	Special Problems ²
ENVE 411	Air Pollution Control
ENVE 421	Mass Transfer Operations
ENVE 434	Water Chemistry and Water Quality Measurements
ENVE 436	Introduction to Hazardous Waste Management
ENVE 438	Water and Wastewater Treatment Design
ENVE 439	Sustainable Solid Waste Engineering
ENVE 443	Bioremediation Engineering
ENVE 450	Industrial Pollution Prevention
ENVE 455	Environmental Health and Safety
ENVE 466	Senior Project Design Laboratory I
ENVE 467	Senior Project Design Laboratory II
ENVE 500	Individual Study ²
ENVE 535	Physico-Chemical Water and Wastewater Treatment
ENVE 536	Biological Wastewater Treatment Engineering
ENVE 542	Sustainable Environmental Engineering

Advisor approved electives outside the primary area of focus

Approved electives outside the primary area of focus ¹	8-14
Total units	45

¹ To be selected after consultation with your academic advisor and the CE/ENVE graduate coordinator

² No more than 4 total units of technical elective credit from CE 400, CE 500 and ENVE 400, ENVE 500 combined.

Computer Engineering

Engineering East Building (20), Room 215
Phone: 805.756.1229
<https://cpe.calpoly.edu>

Director: John Oliver

College of Engineering Advising Center
Engineering South (40), Room 114
Phone: 805.756.1461

Academic Program

Program name	Program type
Computer Engineering	BS

The mission of the Computer Engineering Program (CPE) is to provide students with a well-rounded education encompassing the theory and practice of selected, balanced topics in electrical engineering and computer science, to enable students to contribute and continue their education in a wide range of computer-related engineering careers. The program seeks to emphasize “hands-on” experience, problem solving skills, the creative process and responsible action. Through professional development activities, faculty contribute to the advancement of the state-of-the-art, and strive to directly incorporate this experience in the classroom.

Four educational objectives inspire alumni of the Cal Poly Computer Engineering program to excel professionally:

1. Make positive contributions to society and the practice of computer engineering by applying foundational knowledge and the engineering process to solve engineering problems.
2. Work in an individual or team environment in a socially responsible manner.
3. Engage in lifelong learning through continued professional development or graduate studies.
4. Communicate effectively and demonstrate leadership.

The program prepares graduates for professional practice in industry, as well as continued study in graduate school. Cal Poly’s “learn by doing” philosophy is emphasized by integrating design throughout the curriculum, especially in the numerous design-centered laboratories. In the required senior capstone experience, which is a group-project based course completed over two quarters, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

This integrated approach allows students to work effectively in such diverse areas as digital systems simulation and digital control systems. Knowledge and laboratory experience in computer architecture and structures provide the understanding necessary to design and build computer systems, computer networks and digital communications systems. A thorough knowledge of modern microprocessors and microcontrollers enables the graduate to apply these technologies in applications such as robotics, medical and data acquisition. Twelve units of technical electives allow students the option to specialize in an area of special interest. Current areas of special interest include:

- robotics
- embedded systems
- computer architecture

- computer networks
- computer based controls
- software systems
- graphics and multimedia
- electronics implementation and VLSI

In addition to a sound theoretical background in computer engineering concepts, students experience practical design courses intended to build problem solving skills. Laboratory courses supplement the program to develop “hands on” skills in all areas of study. Students are exposed to a wide variety of computing equipment: microprocessor development systems, workstations and personal computers, and advanced network hardware and software.

Active student groups of interest to computer engineering majors include the Computer Engineering Society, the IEEE Student Branch, the Association for Computing Machinery, the Society of Women Engineers, Women Involved in Software and Hardware, and many other project-oriented student clubs and activities.

For more information about the CPE program, please visit <https://eadvice.calpoly.edu>.

Undergraduate Program BS Computer Engineering

The Bachelor of Science in Computer Engineering prepares students interested in the design and application of computers and computer-based systems. The program incorporates a firm foundation in both electrical engineering and computer science, with a focus on the integration of hardware and software systems.

Blended and Graduate Programs

Graduates of the Computer Engineering Program are qualified for admission to Cal Poly master’s degree programs in electrical engineering, computer science, general engineering, and biomedical engineering.

The opportunity also exists for advanced students to begin graduate study in these areas prior to completion of the BS degree, via a blended program. This provides a number of advantages to qualified students, and makes it possible for completion of both the BS and MS degrees in as little as five years. Computer engineering students participating in a blended program are permitted to fulfill the computer engineering senior project requirement with the master’s degree thesis. Students must be prepared for engineering practice via the curriculum which culminates in a major design experience based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints, as listed in the ABET Engineering Criteria. Further details are provided in the graduate study sections for each of these programs.

BS Computer Engineering Program Learning Outcomes

In addition to the general abilities expected of College of Engineering graduates, computer engineering students are expected to graduate with:

1. An ability to apply knowledge of mathematics, science, and engineering.
2. An ability to design and conduct experiments, as well as to analyze and interpret data.

3. An ability to design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. An ability to function on multidisciplinary teams.
5. An ability to identify, formulate, and solve engineering problems.
6. An understanding of professional and ethical responsibility.
7. An ability to communicate effectively.
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. A recognition of the need for, and an ability to engage in life-long learning.
10. A knowledge of contemporary issues.
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

In addition to the general abilities expected of College of Engineering graduates, computer engineering students are expected to graduate with:

- Knowledge of probability and statistics, including applications appropriate to CPE program objectives.
- Knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to CPE program objectives.
- Knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

CPE 100	Computer Engineering Orientation	1
CPE/CSC 101	Fundamentals of Computer Science	4
CPE/CSC 123	Introduction to Computing ¹	4
CPE/EE 133	Digital Design	4
CPE/CSC 202	Data Structures	4
CPE/CSC 203	Project-Based Object-Oriented Programming and Design	4
CPE/EE 233	Computer Design and Assembly Language Programming	4
CPE 315	Computer Architecture	4
CPE/EE 329	Programmable Logic and Microprocessor-Based Systems Design	4
CPE/CSC 357	Systems Programming	4

CPE 350	Capstone I ⁶	4
CPE 450	Capstone II ⁶	3
CPE/CSC 453	Introduction to Operating Systems	4
CPE 461 & CPE 462	Senior Project I and Senior Project II	5
CPE 464	Introduction to Computer Networks	4
CSC 348	Discrete Structures	4
EE 112	Electric Circuit Analysis I	2
EE 211 & EE 241	Electric Circuit Analysis II and Electric Circuit Analysis Laboratory II	4
EE 212 & EE 242	Electric Circuit Analysis III and Electric Circuit Analysis Laboratory III	4
EE 228	Continuous-Time Signals and Systems	4
EE 306 & EE 346	Semiconductor Device Electronics and Semiconductor Device Electronics Laboratory	4
EE 307 & EE 347	Digital Electronics and Integrated Circuits and Digital Electronics and Integrated Circuits Laboratory	4

Technical Electives ^{2,3,4}

Select from the following:		12
Any 300-500 level CPE Course		
Any 300-500 level CSC or EE Course		
CPE 400	Special Problems for Undergraduates (up to 4 units)	
Up to four units from the following:		
BMED 432	Micro/Nano System Design	
BMED 434/EE 423/MATE 430	Micro/Nano Fabrication	
BMED/MATE 435	Microfabrication Laboratory	
CHEM 312	Survey of Organic Chemistry	
CSC 300	Professional Responsibilities	
CPE 488/IME 458/MATE 458	Microelectronics and Electronics Packaging	
DATA 301	Introduction to Data Science	
ENGR 551	Advanced Topics in Bioengineering	
IME 301	Operations Research I	
IME 303	Project Organization and Management	
IME 314	Engineering Economics	
IME 319	Human Factors Engineering	
IME 401	Sales Engineering	
IME 457	Advanced Electronic Manufacturing	
MATH 304	Vector Analysis	
MATH 408	Complex Analysis I	
MATH 409	Complex Analysis II	
MATH 451	Numerical Analysis I	
ME 405	Mechatronics	
PHYS 322	Vibrations and Waves	

PHYS 323	Optics
PHYS 408	Electromagnetic Fields and Waves I
PHYS 412	Solid State Physics
PHYS 452	Solid State Physics Laboratory
UNIV/HNRS 424	Design of Museum Displays of Science, Engineering and Technology

SUPPORT COURSES

CHEM 124	General Chemistry for Physical Science and Engineering I (B3/B4) ⁵	4
----------	---	---

Approved CSC, EE, Math or Science Elective. ² 3-4

Select from the following:

CHEM 125	General Chemistry for Physical Science and Engineering II	
CPE/EE 328	Discrete Time Signals and Systems	
CSC 349	Design and Analysis of Algorithms	
MATE 210 & MATE 215	Materials Engineering and Materials Laboratory I (both needed)	
ME 211	Engineering Statics	
ENGL 149	Technical Writing for Engineers (A3) ⁵	4
IME 156	Basic Electronics Manufacturing	2-4
or IME 157	Electronics Manufacturing	
or IME 458	Microelectronics and Electronics Packaging	
MATH 141 & MATH 142	Calculus I and Calculus II (B1) ⁵	8
MATH 143	Calculus III (Add'l Area B) ⁵	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
PHYS 141	General Physics IA (Add'l Area B) ⁵	4
PHYS 132 & PHYS 133	General Physics II and General Physics III	8
PHYS 211	Modern Physics I	4
STAT 350	Probability and Random Processes for Engineers (B6) ⁵	4

GENERAL EDUCATION (GE)

(See GE program requirements below.) 44

FREE ELECTIVES

Free Electives 0

Total units 192-195

⁶ ENGR 459, ENGR 460, ENGR 461, and CPE 400 (7) or ENGR 463, ENGR 464, ENGR 465, and CPE 400 (7) may substitute for CPE 350 and CPE 450 (7).

General Education (GE) Requirements

- 72 units required, 28 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		44

¹ Required in Major/Support; also satisfies GE

¹ An additional 4 units of approved technical electives may be substituted, although new students are strongly encouraged to take CSC 123/CPE 123.

² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

³ The courses selected to satisfy this requirement may not be used to satisfy other major, support, or general education requirements (no double counting of coursework).

⁴ The following courses may not be used to satisfy this requirement: COOP units; BUS 499; CSC 302, CSC 303, CSC 310, CSC 400, CSC 500; EE 321, EE 322, EE 361, EE 400, EE 460, EE 500, EE 563.

⁵ Required in Major/Support; also satisfies GE.

Computer Science and Software Engineering

Computer Science Bldg. (14), Room 254
Phone: 805.756.2824
<https://csc.calpoly.edu>

Department Chair: Franz Kurfess

College of Engineering Advising Center

Engineering South (40), Room 114
Phone: 805.756.1461

Academic Programs

Program name	Program type
Computer Engineering	BS
Computer Science	BS, MS, Minor
Computing for Interactive Arts	Minor
Cross Disciplinary Studies Minor in Data Science	Minor
Software Engineering	BS

The Computer Science Department educates students in the discipline of computer science and teaches them to apply their education to solve practical problems in a socially responsible way. To support the department's educational mission, faculty engage in research and professional development.

In all of the department's programs, laboratory experiences ensure that students have both a theoretical and practical understanding of computer science. Individual and team projects, culminating in the capstone experience of a senior project, reinforce concepts and provide students the opportunity to apply and communicate their knowledge.

The department has active student chapters of the Association for Computing Machinery, IEEE Computer Society and Upsilon Pi Epsilon (the national computer honor society). Student teams compete in national competitions and student organizations sponsor industry/student events.

The department, with industry support, provides a modern computing environment that includes the most current software tools running on a variety of workstations and servers. Projects in advanced courses are supported by specialized laboratories for databases, computer architecture, operating systems, software engineering, computer networks, computer graphics, and human/computer interaction.

Undergraduate Programs

BS Computer Science

The BS Computer Science program provides in-depth study of computer science fundamentals and practice, including programming concepts and languages, software engineering, operating systems and computer architecture.

In addition, the major offers a wide choice of technical electives that allows students to focus on particular areas of computer science and their application. Typical areas of emphasis include databases, distributed computing, software engineering, programming languages, graphical user interfaces, operating systems, computer networks, computer graphics, and artificial intelligence.

The curriculum is project-oriented and develops students' ability to solve problems using modern computing concepts. Students can expect to complete many projects in a variety of programming languages and on a variety of computer systems. During their last year of study, students complete a senior project, either individually or as members of a team, spanning two academic quarters.

Graduates of the computer science program are well prepared to become successful professionals and to pursue graduate study. They are sought by the computer industry for positions as software developers, quality assurance and test engineers, and other technical positions in computer-related industries.

The Computer Science program has four broad program educational objectives (PEOs) that graduates are expected to attain within five years of graduation:

- **Technical Competence.** Graduates have applied current technical knowledge and skills to develop effective computer solutions, using state-of-the-art technologies.
- **Interpersonal Skills.** Graduates have communicated effectively and worked collaboratively in a team environment.
- **Professional Awareness.** Graduates have maintained a positive and ethical attitude concerning the computing profession and its impact on individuals, organizations and society.
- **Intellectual Growth.** Graduates have continued to grow intellectually and professionally in their chosen field, including successful pursuit of graduate study if such study was a desired goal.

The BS Computer Science program is accredited by the Computing Accreditation Commission of ABET, <http://www.ABET.org>.

Concentration

Interactive Entertainment

The Interactive Entertainment concentration focuses on providing the preparation necessary to succeed in technical-oriented careers relating to computer graphics, digital animation, video games and interactive experiences. Students will take part in multiple project-based courses involving significant programming and design work, and will employ relevant industry practices.

BS Software Engineering

The BS in Software Engineering prepares students to become software professionals who develop software products on time, within budget, and that meet customer requirements. Building on the fundamentals of computer science, the program focuses on practical aspects of building and deploying software systems in a socially responsible way. The program's educational mission supports the faculty in research and professional development that keeps them current in their field and in touch with current industry practices and trends.

The hallmark of the program is "hands on" experience where students follow a curriculum that builds on traditional computer science but differs from the BS in Computer Science in the following ways:

1. Classes emphasize the team approach to building software and provide leadership opportunities for every student.
2. Classes place an emphasis on software processes and lifecycles.
3. Classes include significant learning in engineering and management areas such as quality assurance, testing, metrics, maintenance, configuration management and interpersonal management skills.

4. The curriculum has a stronger emphasis on mathematics and the use of engineering methods in software design.

The software engineering curriculum culminates in a year-long capstone sequence where the students work in teams to build a large software system. Students are required to develop an ability to work in a significant application domain through the requirement of an advisor approved cooperative education experience.

Department programs are designed to be flexible. Although freshmen choose their major when they apply for admission, students can easily switch among software engineering, computer engineering and computer science since the lower division curricula are similar.

The software industry increasingly requires both a software and an engineering background for their cutting edge projects. Graduates with a BS in Software Engineering can expect to find significant opportunities in software development and management, software engineering and marketing.

The Software Engineering program has four broad program educational objectives (PEOs) that graduates are expected to attain within five years of graduation:

- **Technical Competence.** Graduates have applied the software engineering body of knowledge and other technical skills to specify, design, and implement complex software systems, doing so with state-of-the art technologies.
- **Interpersonal Skills.** Graduates have communicated effectively and worked collaboratively in a multi-disciplinary team environment.
- **Professional Awareness.** Graduates have maintained a positive and ethical attitude concerning the computing profession and its impact on individuals, organizations and society.
- **Intellectual Growth.** Graduates have continued to grow intellectually and professionally in their chosen field, including successful pursuit of graduate study if such study was a desired goal.

The BS Software Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.ABET.org>.

BS Computer Engineering

This program is jointly administered by the Computer Science Department and the Electrical Engineering Department. For information regarding this program, please refer to Computer Engineering (p. 216).

Computer Science Minor

Nearly all disciplines use the capabilities of computers. The minor consists of a core and upper-division courses selected in consultation with an advisor. The core provides common knowledge and skills needed by anyone who wishes to advance further in computer science. The remaining courses enable students to specialize in areas relevant to their goals.

Admission to the minor is limited and selection is based upon the applicant's performance in:

CSC/CPE 101	Fundamentals of Computer Science	4
CSC/CPE 202	Data Structures	4
CSC/CPE 203	Project-Based Object-Oriented Programming and Design	4

Students who intend to minor in computer science should consult the College of Engineering Advising Center website for GPA and course grade requirements for admission to the minor. In addition, they should contact the Advising Center for further information *before* planning to enter the minor.

Before formally applying, students must make an appointment at the College of Engineering Advising Center. The computer science minor is not open to CSC, CPE or Software Engineering (SE) major students. Questions concerning the minor should be directed to the Advising Center.

Computing for Interactive Arts Minor

The minor in Computing for Interactive Arts (CIA) is a Cross Disciplinary Studies Minor jointly offered by the Department of Art and Design and the Computer Science Department. The CIA minor fosters a collaborative, cross-disciplinary environment in which Art and Design students integrate coding and algorithmic thinking in creative works and Computer Science students apply the principles and methodology of design thinking to visual applications. The minor enables students from different disciplines to collaborate on projects requiring both a technical and a creative perspective.

Cross Disciplinary Studies Minor in Data Science

An interdisciplinary minor sponsored by the departments of Statistics and Computer Science. For more information, see the Statistics (p. 395) section.

Graduate Program MS Computer Science

The MS program in Computer Science offers students the opportunity to prepare for careers in several areas of emphasis including software engineering, computer architecture, programming languages, theory of computing, operating systems, database systems, distributed computing, computer networks, artificial intelligence, computer graphics, and human computer interaction. The program is designed for maximum flexibility to allow students to concentrate in one or more areas of study.

Eligibility for admission to the program requires a baccalaureate degree from an accredited institution and good standing at the last college attended. Admission can be granted in either classified or conditionally classified status. Classified admission can be granted to domestic and overseas applicants who satisfy the following conditions: applicants with a bachelor's degree in computer science, software engineering, or computer engineering are required to have a minimum 3.0 grade point average, including a minimum 3.0 grade point average in major courses; applicants with a bachelor's degree in a different field must have completed the required preliminary coursework listed in the table below and have a minimum grade point average of 3.25 for all undergraduate coursework. Conditionally classified admission can be granted to domestic applicants who satisfy the following conditions: The applicant must hold a Computer Science minor obtained as part of their undergraduate study, or they must have successfully completed introductory and upper-division Computer Science coursework in the amount equivalent to the Computer Science minor (an equivalent of about 28-32 quarter units). Specifically, applicants are expected to have

completed the equivalent of 24 units of coursework (6 courses) from the below list, prior to starting their MS in Computer Science study.

All applicants must satisfy the following. A satisfactory score on the General Graduate Record Exam (GRE) is required; applicants are expected to achieve the following minimum scores: 425 verbal, 650 quantitative, 4.0 analytical writing on the old GRE test, or their matching equivalents on the revised GRE test (currently standing at 148 verbal, 158 quantitative and 4.0 analytical writing). A satisfactory score on the TOEFL is required for applicants with degrees from institutions from countries where English is not a native language; expected minimum scores are: 80 for internet-based test with a minimum 20 on each portion; 213 for computer-based test; 550 for paper-based test, plus 4.5 on TWE. All applicants must provide three letters of recommendation. Women and underrepresented minorities are strongly encouraged to apply for admission.

Students admitted as conditionally classified must complete the necessary undergraduate coursework to advance to candidacy. While fulfilling the undergraduate requirements, conditionally classified students retain official status as graduate students in the university. Conditionally classified students may advance to candidacy by completing coursework selected by the graduate coordinator from the following list of courses:

CSC 300	Professional Responsibilities	4
CSC 307	Introduction to Software Engineering	4
or CSC 308	Software Engineering I	
CPE 315	Computer Architecture	4
CSC 349	Design and Analysis of Algorithms	4
CSC/CPE 357	Systems Programming	4
CSC 430	Programming Languages I	4
CSC 445	Theory of Computation I	4
CSC/CPE 453	Introduction to Operating Systems	4

Each course must be completed with a grade of "B" or better. These courses do not count toward the graduate degree.

The department may offer several graduate teaching assistantships. Preference is given to continuing graduate students and experienced teachers. Other grant, fellowship, scholarship and loan information can be obtained from the Financial Aid office.

Degree Requirements

Students must file a Formal Study Plan with the Computer Science Department office no later than the end of the quarter in which they complete the twelfth unit of coursework to be counted toward the degree. The formal study plan identifies specific courses to be taken to fulfill requirements of the MS degree. The formal study plan may be amended with approval of the graduate coordinator.

Blended BS + MS Computer Science

The department offers an accelerated program for motivated, well-qualified students. The blended program allows BS Computer Science, BS Computer Engineering, and BS Software Engineering students to progress toward the Master's degree while still undergraduates. The scheduling flexibility provided by the program enables students to complete the BS and MS degrees efficiently.

Eligibility

Students majoring in BS Computer Science, BS Software Engineering, and BS Computer Engineering are eligible to apply to the blended program if they meet the following minimum eligibility requirements:

- Junior status and completion of 20 units of CSC/CPE courses past CSC 203/CPE 203; and
- Meet the minimum GPA requirement of 3.0

Participation in the program is based on prior academic performance and other measures of professional promise. Students are selected by a faculty committee.

Program of Study

Students in the blended program complete all courses required for the MS degree and all courses required for the BS degree. Completion of the MS thesis may satisfy the senior project requirement. Please refer to your undergraduate degree department office for any restrictions on the master's thesis where a major design experience is required to complete the undergraduate degree.

Upon completion of the program, students are awarded the BS and the MS degrees at the same graduation ceremony and at the same time. Degrees are earned concurrently.

BS Computer Science

Program Learning Outcomes

1. An ability to apply knowledge of computing and mathematics appropriate to the discipline.
2. An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
3. An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
4. An ability to function effectively on teams to accomplish a common goal.
5. An understanding of professional, ethical, legal, security, and social issues and responsibilities.
6. An ability to communicate effectively with a range of audiences.
7. An ability to analyze the local and global impact of computing on individuals, organizations, and society.
8. Recognition of the need for, and an ability to engage in continuing professional development.
9. An ability to use current techniques, skills, and tools necessary for computing practice.
10. An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension and the tradeoffs involved in design choices.
11. An ability to apply design and development principles in the construction of software systems of varying complexity.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)

- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

CSC/CPE 101	Fundamentals of Computer Science	4
CSC/CPE 123	Introduction to Computing ²	4
Select from the following:		4
CSC/CPE 108	Accelerated Introduction to Computer Science	
CSC/CPE 202	Data Structures	
CSC/CPE 203	Project-Based Object-Oriented Programming and Design	4
CSC 225	Introduction to Computer Organization	4
CSC 300	Professional Responsibilities	4
Select from the following:		4
CSC 307	Introduction to Software Engineering	
or		
CSC 308 & CSC 309	Software Engineering I and Software Engineering II ³	
CPE 315	Computer Architecture	4
CSC 348	Discrete Structures	4
CSC 349	Design and Analysis of Algorithms	4
CSC/CPE 357	Systems Programming	4
CSC 430	Programming Languages I	4
CSC/CPE 431	Programming Languages II	4
CSC 445	Theory of Computation I	4
CSC/CPE 453	Introduction to Operating Systems	4
CSC 491 & CSC 492	Senior Project I and Senior Project II (2, 2)	4
Concentration or Technical Electives		24
Select concentration, or select from the lists in technical electives guidelines below ^{4,5}		

SUPPORT COURSES

ENGL 149	Technical Writing for Engineers (A3) ¹	4
MATH 141	Calculus I (B1) ¹	4
MATH 142	Calculus II (B1) ¹	4
MATH 143	Calculus III	4
MATH 206	Linear Algebra I	4
or MATH 244	Linear Analysis I	
STAT 312	Statistical Methods for Engineers (B6) ¹	4

Life Science Support Elective

Select from the following:		4-5
BIO 111	General Biology (B2) ¹	
BIO 161	Introduction to Cell and Molecular Biology (B2) ¹	
BIO 213 & BMED 213	Life Science for Engineers and Bioengineering Fundamentals (B2) ¹	
BOT 121	General Botany (B2) ¹	
MCRO 221	Microbiology (B2) ¹	
MCRO 224	General Microbiology I (B2) ¹	

Mathematics/Statistics Support Elective

Select from the following:		4
MATH 241	Calculus IV	
MATH 248	Methods of Proof in Mathematics	
MATH 306	Linear Algebra II	
MATH 335	Graph Theory	
MATH 336	Combinatorial Math	
MATH 437	Game Theory	
MATH 470	Selected Advanced Topics	
STAT 313	Applied Experimental Design and Regression Models	
STAT 323	Design and Analysis of Experiments I	
STAT 324	Applied Regression Analysis	
STAT 330	Statistical Computing with SAS	
STAT 331	Statistical Computing with R	
STAT 416	Statistical Analysis of Time Series	
STAT 418	Categorical Data Analysis	
STAT 419	Applied Multivariate Statistics	

Physical Science Support Elective

Select one sequence from the following:		12
CHEM 124 & CHEM 125 & CHEM 126	General Chemistry for Physical Science and Engineering I and General Chemistry for Physical Science and Engineering II and General Chemistry for Physical Science and Engineering III (B3, B4) ¹	
PHYS 141 & PHYS 132 & PHYS 133	General Physics IA and General Physics II and General Physics III (B3, B4) ¹	

Additional Science Support Elective ⁶

Select from the following:		4-5
BIO 111	General Biology (B2)	
BIO 161	Introduction to Cell and Molecular Biology (B2)	
BOT 121	General Botany (B2)	
CHEM 124	General Chemistry for Physical Science and Engineering I (B3)	
MCRO 221	Microbiology (B2)	
MCRO 224	General Microbiology I (B2)	
PHYS 141	General Physics IA (B3)	

Upper-division Elective

Select any upper-division course(s)	4
-------------------------------------	---

GENERAL EDUCATION (GE)

(See list of GE program requirements below.)	40
--	----

FREE ELECTIVES

Total units	180-181
-------------	---------

¹ Required in Support; also satisfies GE.

² An additional 4 units of CPE/CSC technical electives may substitute for CPE/CSC 123, although new students are strongly encouraged to take CPE/CSC 123.

³ CSC 309 counts as Technical Elective. Students in the Interactive Entertainment Concentration are advised to take CSC 307 instead of CSC 308 and CSC 309.

⁴ Consultation with advisor is recommended prior to selecting technical electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

⁵ An additional 4 units of CPE/CSC technical electives is needed if CSC 123 is not taken.

⁶ No double counting is allowed between Additional Science Support Elective and Life Science Support Elective or Physical Science Support Elective.

Technical Electives Guidelines

Courses used to satisfy any other major, support, or general education requirement are not allowed to count toward Technical Elective requirement. Credit/No Credit grading is not allowed.

Select Technical Electives from the following: ¹

CSC 301	Personal Software Process
CSC 305	Individual Software Design and Development
CSC 309	Software Engineering II
CSC 321	Introduction to Computer Security
CSC 323	Cryptography Engineering
CSC 325	Introduction to Privacy: Policy and Technology
CSC 344	Music Programming
CSC 365	Introduction to Database Systems
CSC 366	Database Modeling, Design and Implementation
CSC 369	Introduction to Distributed Computing
CSC 371	Game Design
CSC 378	Interactive Entertainment Engineering
CSC 400	Special Problems
CSC 402	Software Requirements Engineering
CSC 405	Software Construction
CSC 406	Software Deployment
CSC 409	Current Topics in Software Engineering
CSC 410	Software Evaluation
CSC 422	Network and Web Security
CSC 424	Software Security
CSC 429	Current Topics in Computer Security
CSC 435	Introduction to Object Oriented Design Using Graphical User Interfaces
CSC 436	Mobile Application Development
CSC 437	Web Development
CSC 448	Bioinformatics Algorithms
CSC/CPE 454	Implementation of Operating Systems
CSC/CPE 458	Current Topics in Computer Systems
CSC 466	Knowledge Discovery from Data
CSC 468	Database Management Systems Implementation
CSC/CPE 471	Introduction to Computer Graphics

CSC 473	Advanced Rendering Techniques
CSC 474	Computer Animation
CSC/CPE 476	Real-Time 3D Computer Graphics Software
CSC 477	Scientific and Information Visualization
CSC 478	Current Topics in Computer Graphics
CSC 480	Artificial Intelligence
CSC 481	Knowledge Based Systems
CSC 483	Current Topics in Human-Computer Interaction
CSC 484	User-Centered Interface Design and Development
CSC 486	Human-Computer Interaction Theory and Design
CSC 489	Current Topics in Artificial Intelligence
CSC 490	Selected Advanced Topics
CSC 496	Selected Advanced Laboratory
CSC 508	Software Engineering I
CSC 509	Software Engineering II
CSC/CPE 515	Computer Architecture
CSC 521	Computer Security
CSC 530	Languages and Translators
CSC 540	Theory of Computation II
CSC 550	Operating Systems
CSC 560	Database Systems
CSC/CPE 564	Computer Networks: Research Topics
CSC 566	Topics in Advanced Data Mining
CSC/CPE 569	Distributed Computing
CSC 570	Current Topics in Computer Science
CSC 572	Computer Graphics
CSC 580	Artificial Intelligence
CSC 581	Computer Support for Knowledge Management
CSC 582	Introduction to Natural Language Processing
CPE 400	Special Problems for Undergraduates
CPE 416	Autonomous Mobile Robotics
CPE 419	Applied Parallel Computing
CPE 428	Computer Vision
CPE 464	Introduction to Computer Networks
CPE 465	Advanced Computer Networks
CPE 482	Advanced Topics in Systems for Computer Engineering
CPE 485	Autonomous Robot Navigation
CPE 488	Microelectronics and Electronics Packaging
DATA 301	Introduction to Data Science

The following restrictions must be satisfied.

4 units must be satisfied by a course that has as a prerequisite either

1) An upper-division course required by the major (excluding CSC 357 and CSC 348) or

2) Another technical elective.

Select from the following:

CSC 325	Introduction to Privacy: Policy and Technology
CSC 366	Database Modeling, Design and Implementation
CSC 402	Software Requirements Engineering
CSC 405	Software Construction
CSC 406	Software Deployment
CSC 409	Current Topics in Software Engineering
CSC 410	Software Evaluation
CSC 422	Network and Web Security
CSC 424	Software Security
CSC 429	Current Topics in Computer Security
CSC 435	Introduction to Object Oriented Design Using Graphical User Interfaces
CSC 437	Web Development
CSC/CPE 454	Implementation of Operating Systems
CSC 466	Knowledge Discovery from Data
CSC 468	Database Management Systems Implementation
CSC 473	Advanced Rendering Techniques
CSC 474	Computer Animation
CSC/CPE 476	Real-Time 3D Computer Graphics Software
CSC 477	Scientific and Information Visualization
CSC 478	Current Topics in Computer Graphics
CSC 481	Knowledge Based Systems
CSC 483	Current Topics in Human-Computer Interaction
CSC 484	User-Centered Interface Design and Development
CSC 486	Human-Computer Interaction Theory and Design
CSC 489	Current Topics in Artificial Intelligence
CSC 508	Software Engineering I
CSC 509	Software Engineering II
CSC/CPE 515	Computer Architecture
CSC 521	Computer Security
CSC 530	Languages and Translators
CSC 540	Theory of Computation II
CSC 550	Operating Systems
CSC 560	Database Systems
CSC/CPE 564	Computer Networks: Research Topics
CSC 566	Topics in Advanced Data Mining
CSC 572	Computer Graphics

CSC 580	Artificial Intelligence
CSC 581	Computer Support for Knowledge Management
CSC 582	Introduction to Natural Language Processing
CPE 416	Autonomous Mobile Robotics
CPE 465	Advanced Computer Networks
Up to 4 units may be taken from CSC 400, CPE 400, or CSC 490.	
Up to 4 units may be taken from approved external electives.	
Select from the following:	
AERO 450	Introduction to Aerospace Systems Engineering
ART 384	Digital 3D Modeling and Design
BUS 310	Introduction to Entrepreneurship
CHEM 216	Organic Chemistry I
CHEM 217	Organic Chemistry II
CHEM 218	Organic Chemistry III
CHEM 312	Survey of Organic Chemistry
ECON 339	Econometrics
EE 201 & EE 251	Electric Circuit Theory and Electric Circuits Laboratory
EE 314	Introduction to Communication Systems
EE/CPE 336	Microprocessor System Design
EE 424	Introduction to Remote Sensing
ENVE 542	Sustainable Environmental Engineering
IME 301	Operations Research I
IME 314	Engineering Economics
IME 356	Manufacturing Automation
MATH 241	Calculus IV
MATH 242	Differential Equations I
MATH 248	Methods of Proof in Mathematics
MATH 304	Vector Analysis
MATH 341	Theory of Numbers
MATH 350	Mathematical Software
MATH 412	Introduction to Analysis I
ME 211	Engineering Statics
ME 212	Engineering Dynamics
ME 405	Mechatronics
PHIL 412	Epistemology
PHIL 422	Philosophy of Mind
PSY 329	Research Methods in Psychology
PSY 333	Quantitative Research Methods for the Behavioral Sciences
PSY 351	Group Dynamics
PSY 457	Memory and Cognition
STAT 313	Applied Experimental Design and Regression Models
STAT 323	Design and Analysis of Experiments I
STAT 324	Applied Regression Analysis
STAT 330	Statistical Computing with SAS

STAT 331	Statistical Computing with R	
STAT 416	Statistical Analysis of Time Series	
STAT 418	Categorical Data Analysis	
STAT 419	Applied Multivariate Statistics	
Total units		24

¹ A total of 24 technical elective units selected from upper-division and graduate CSC and CPE courses open to those in the major and not otherwise required by the major.
An additional 4 units of CPE/CSC technical electives is needed if CSC 123 is not taken.

Concentration

Interactive Entertainment (p. 225)

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		40

¹ Required in Support; also satisfies GE.

Interactive Entertainment Concentration

CSC 371	Game Design	4
---------	-------------	---

CSC 378	Interactive Entertainment Engineering	4
CSC/CPE 471	Introduction to Computer Graphics	4
CSC/CPE 476	Real-Time 3D Computer Graphics Software	4
CSC 480	Artificial Intelligence	4
Select from the following:		4
CSC 473	Advanced Rendering Techniques	
CSC 474	Computer Animation	
CSC 478	Current Topics in Computer Graphics	
CSC 484	User-Centered Interface Design and Development	
CSC 572	Computer Graphics	
CSC 580	Artificial Intelligence	
Total units		24

BS Software Engineering

Program Learning Outcomes

1. An ability to apply knowledge of mathematics, science, and engineering.
2. An ability to design and conduct experiments, as well as to analyze and interpret data.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. An ability to function on multi-disciplinary teams.
5. An ability to identify, formulate, and solve engineering problems.
6. An understanding of professional and ethical responsibility.
7. An ability to communicate effectively.
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. A recognition of the need for, and an ability to engage in life-long learning.
10. A knowledge of contemporary issues.
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

CSC/CPE 101	Fundamentals of Computer Science	4
Select from the following:		4

CSC/CPE 108	Accelerated Introduction to Computer Science	
CSC/CPE 202	Data Structures	
CSC/CPE 123	Introduction to Computing ²	4
CSC/CPE 203	Project-Based Object-Oriented Programming and Design	4
CSC 225	Introduction to Computer Organization	4
CSC 300	Professional Responsibilities	4
CSC 305	Individual Software Design and Development	4
CSC 308	Software Engineering I	4
CSC 309	Software Engineering II	4
CSC 348	Discrete Structures	4
CSC 349	Design and Analysis of Algorithms	4
CSC/CPE 357	Systems Programming	4
CSC 402	Software Requirements Engineering	4
CSC 405	Software Construction	4
CSC 406	Software Deployment	4
CSC 430	Programming Languages I	4
CSC 484	User-Centered Interface Design and Development	4
CSC 491 & CSC 492	Senior Project I and Senior Project II	4
Select Technical Electives based on guidelines below ^{3,4}		20

SUPPORT COURSES

ENGL 149	Technical Writing for Engineers (A3) ¹	4
IME 314	Engineering Economics	3
MATH 141	Calculus I (B1) ¹	4
MATH 142	Calculus II (B1) ¹	4
MATH 143	Calculus III (Add'l Area B) ¹	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
PSY 201/202	General Psychology (D4) ¹	4
PSY 350	Teamwork	4
or PSY 351	Group Dynamics	
or COMS 217	Small Group Communication	
STAT 312	Statistical Methods for Engineers (B6) ¹	4

Life Science Support Electives:Select from the following: ¹ 4-5

BIO 111	General Biology (B2 & B4)	
BIO 161	Introduction to Cell and Molecular Biology (B2 & B4)	
BIO 213 & BMED 213	Life Science for Engineers and Bioengineering Fundamentals (B2)	
BOT 121	General Botany (B2 & B4)	
MCRO 221	Microbiology (B2 & B4)	
MCRO 224	General Microbiology I (B2 & B4)	

Mathematics Support Electives:

Select from the following: 4

MATH 248	Methods of Proof in Mathematics	
MATH 304	Vector Analysis	

MATH 335	Graph Theory	
MATH 336	Combinatorial Math	
MATH 451	Numerical Analysis I	
Physical Science Support Electives		
Select one of the following series: ¹		12
CHEM 124 & CHEM 125 & CHEM 126	General Chemistry for Physical Science and Engineering I and General Chemistry for Physical Science and Engineering II and General Chemistry for Physical Science and Engineering III	
PHYS 141 & PHYS 132 & PHYS 133	General Physics IA and General Physics II and General Physics III	

GENERAL EDUCATION (GE)

(See GE program requirements below.) 36

FREE ELECTIVES

Free Electives 0

Total units 187-188

- ¹ Required in Major/Support; also satisfies GE.
- ² An additional 4 units of CPE/CSC technical electives may substitute, although new students are strongly encouraged to take CSC 123.
- ³ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
- ⁴ An additional 4 units of CPE/CSC technical electives is needed if CSC 123 is not taken.

Technical Electives Guidelines

Courses used to satisfy any other Major, Support, or General Education requirement are not allowed to count toward Technical Elective requirement. Credit/No Credit grading is not allowed.

Contact the CSC Department for further information.

Select Technical Electives from the following: ¹

CSC 301	Personal Software Process
CSC/CPE 321	Introduction to Computer Security
CSC 323	Cryptography Engineering
CSC 325	Introduction to Privacy: Policy and Technology
CSC 344	Music Programming
CSC 365	Introduction to Database Systems
CSC 366	Database Modeling, Design and Implementation
CSC 369	Introduction to Distributed Computing
CSC 371	Game Design
CSC 378	Interactive Entertainment Engineering
CSC 400	Special Problems
CSC 409	Current Topics in Software Engineering
CSC 410	Software Evaluation
CSC 422	Network and Web Security

CSC 424	Software Security
CSC 429	Current Topics in Computer Security
CSC/CPE 431	Programming Languages II
CSC 435	Introduction to Object Oriented Design Using Graphical User Interfaces
CSC 436	Mobile Application Development
CSC 437	Web Development
CSC 445	Theory of Computation I
CSC 448	Bioinformatics Algorithms
CSC/CPE 453	Introduction to Operating Systems
CSC/CPE 454	Implementation of Operating Systems
CSC/CPE 458	Current Topics in Computer Systems
CSC 466	Knowledge Discovery from Data
CSC 468	Database Management Systems Implementation
CSC/CPE 471	Introduction to Computer Graphics
CSC 473	Advanced Rendering Techniques
CSC 474	Computer Animation
CSC/CPE 476	Real-Time 3D Computer Graphics Software
CSC 477	Scientific and Information Visualization
CSC 478	Current Topics in Computer Graphics
CSC 480	Artificial Intelligence
CSC 481	Knowledge Based Systems
CSC 483	Current Topics in Human-Computer Interaction
CSC 486	Human-Computer Interaction Theory and Design
CSC 489	Current Topics in Artificial Intelligence
CSC 490	Selected Advanced Topics
CSC 508	Software Engineering I
CSC 509	Software Engineering II
CSC/CPE 515	Computer Architecture
CSC 521	Computer Security
CSC 530	Languages and Translators
CSC 540	Theory of Computation II
CSC 550	Operating Systems
CSC 560	Database Systems
CSC/CPE 564	Computer Networks: Research Topics
CSC 566	Topics in Advanced Data Mining
CSC/CPE 569	Distributed Computing
CSC 570	Current Topics in Computer Science
CSC 572	Computer Graphics
CSC 580	Artificial Intelligence
CSC 581	Computer Support for Knowledge Management
CSC 582	Introduction to Natural Language Processing
CPE 315	Computer Architecture

CPE 400	Special Problems for Undergraduates
CPE 416	Autonomous Mobile Robotics
CPE 419	Applied Parallel Computing
CPE/EE 428	Computer Vision
CPE 464	Introduction to Computer Networks
CPE 465	Advanced Computer Networks
CPE 482	Advanced Topics in Systems for Computer Engineering
CPE 485	Autonomous Robot Navigation
CPE 488/ IME 458/MATE 458	Microelectronics and Electronics Packaging
DATA 301	Introduction to Data Science
The following restrictions must be satisfied	
4 of these units must be satisfied by a course that has as a prerequisite either	
1) An upper-division course required by the major (excluding CSC 357 and CSC 348) or	
2) Another technical elective	
Select from the following:	
CSC 325	Introduction to Privacy: Policy and Technology
CSC 366	Database Modeling, Design and Implementation
CSC 409	Current Topics in Software Engineering
CSC 410	Software Evaluation
CSC 422	Network and Web Security
CSC 424	Software Security
CSC 429	Current Topics in Computer Security
CSC/CPE 431	Programming Languages II
CSC 435	Introduction to Object Oriented Design Using Graphical User Interfaces
CSC 437	Web Development
CSC/CPE 454	Implementation of Operating Systems
CSC 466	Knowledge Discovery from Data
CSC 468	Database Management Systems Implementation
CSC 473	Advanced Rendering Techniques
CSC 474	Computer Animation
CSC/CPE 476	Real-Time 3D Computer Graphics Software
CSC 477	Scientific and Information Visualization
CSC 478	Current Topics in Computer Graphics
CSC 481	Knowledge Based Systems
CSC 483	Current Topics in Human-Computer Interaction
CSC 486	Human-Computer Interaction Theory and Design
CSC 489	Current Topics in Artificial Intelligence
CSC 508	Software Engineering I

CSC 509	Software Engineering II
CSC/CPE 515	Computer Architecture
CSC 521	Computer Security
CSC 530	Languages and Translators
CSC 540	Theory of Computation II
CSC 550	Operating Systems
CSC 560	Database Systems
CSC/CPE 564	Computer Networks: Research Topics
CSC 566	Topics in Advanced Data Mining
CSC 572	Computer Graphics
CSC 580	Artificial Intelligence
CSC 581	Computer Support for Knowledge Management
CSC 582	Introduction to Natural Language Processing
CPE 416	Autonomous Mobile Robotics
CPE 465	Advanced Computer Networks

Up to 4 units may be taken from CSC 400, CPE 400, or CSC 490.

Up to 4 units may be taken from approved external electives.

Select from the following:

AERO 450	Introduction to Aerospace Systems Engineering
ART 384	Digital 3D Modeling and Design
BUS 310	Introduction to Entrepreneurship
CHEM 216	Organic Chemistry I
CHEM 217	Organic Chemistry II
CHEM 218	Organic Chemistry III
CHEM 312	Survey of Organic Chemistry
ECON 339	Econometrics
EE 201 & EE 251	Electric Circuit Theory and Electric Circuits Laboratory
EE 314	Introduction to Communication Systems
EE/CPE 336	Microprocessor System Design
EE 424	Introduction to Remote Sensing
ENVE 542	Sustainable Environmental Engineering
IME 301	Operations Research I
IME 356	Manufacturing Automation
MATH 206	Linear Algebra I
MATH 242	Differential Equations I
MATH 248	Methods of Proof in Mathematics
MATH 304	Vector Analysis
MATH 341	Theory of Numbers
MATH 350	Mathematical Software
MATH 412	Introduction to Analysis I
ME 211	Engineering Statics
ME 212	Engineering Dynamics
ME 405	Mechatronics
PHIL 412	Epistemology
PHIL 422	Philosophy of Mind

PSY 329	Research Methods in Psychology
PSY 333	Quantitative Research Methods for the Behavioral Sciences
PSY 351	Group Dynamics
PSY 457	Memory and Cognition
STAT 313	Applied Experimental Design and Regression Models
STAT 323	Design and Analysis of Experiments I
STAT 324	Applied Regression Analysis
STAT 330	Statistical Computing with SAS
STAT 331	Statistical Computing with R
STAT 416	Statistical Analysis of Time Series
STAT 418	Categorical Data Analysis
STAT 419	Applied Multivariate Statistics
Total units	20

- ¹ A total of 20 technical elective units selected from upper-division and graduate CSC and CPE courses open to those in the major and not otherwise required by the major.
An additional 4 units of CPE/CSC technical electives may substitute for CSC 123 in major requirements.

General Education (GE) Requirements

- 72 units required, 36 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support)	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4

D4	Self Development (CSU Area E) (4 units in Support) ¹	0
Total units		36

¹ Required in Major/Support; also satisfies GE.

Computer Science Minor

Required Courses

CSC/CPE 101	Fundamentals of Computer Science	4
CSC/CPE 202	Data Structures	4
CSC/CPE 203	Project-Based Object-Oriented Programming and Design	4
CSC 225	Introduction to Computer Organization	4
CSC/CPE 357	Systems Programming	4

Approved Electives¹

Select from the following:		12
CPE 315	Computer Architecture	
CPE 416	Autonomous Mobile Robotics	
CPE 419	Applied Parallel Computing	
CPE 464	Introduction to Computer Networks	
CPE 465	Advanced Computer Networks	
CPE 482	Advanced Topics in Systems for Computer Engineering	
CPE 485	Autonomous Robot Navigation	
CSC 300	Professional Responsibilities	
CSC 301	Personal Software Process	
CSC 305	Individual Software Design and Development	
CSC 307	Introduction to Software Engineering	
CSC 308	Software Engineering I	
CSC 309	Software Engineering II	
CSC/CPE 321	Introduction to Computer Security	
CSC 323	Cryptography Engineering	
CSC 325	Introduction to Privacy: Policy and Technology	
CSC 344	Music Programming	
CSC 348	Discrete Structures	
CSC 349	Design and Analysis of Algorithms	
CSC 365	Introduction to Database Systems	
CSC 366	Database Modeling, Design and Implementation	
CSC 369	Introduction to Distributed Computing	
CSC 371	Game Design	
CSC 378	Interactive Entertainment Engineering	
CSC 400	Special Problems ²	
CSC 402	Software Requirements Engineering	
CSC 405	Software Construction	
CSC 406	Software Deployment	
CSC 409	Current Topics in Software Engineering	

CSC 410	Software Evaluation
CSC/CPE 422	Network and Web Security
CSC 424	Software Security
CSC 429	Current Topics in Computer Security
CSC 430	Programming Languages I
CSC/CPE 431	Programming Languages II
CSC 435	Introduction to Object Oriented Design Using Graphical User Interfaces
CSC 436	Mobile Application Development
CSC 437	Web Development
CSC 445	Theory of Computation I
CSC 448	Bioinformatics Algorithms
CSC/CPE 453	Introduction to Operating Systems
CSC/CPE 454	Implementation of Operating Systems
CSC/CPE 458	Current Topics in Computer Systems
CSC 466	Knowledge Discovery from Data
CSC 468	Database Management Systems Implementation
CSC/CPE 471	Introduction to Computer Graphics
CSC 473	Advanced Rendering Techniques
CSC 474	Computer Animation
CSC/CPE 476	Real-Time 3D Computer Graphics Software
CSC 477	Scientific and Information Visualization
CSC 478	Current Topics in Computer Graphics
CSC 480	Artificial Intelligence
CSC 481	Knowledge Based Systems
CSC 483	Current Topics in Human-Computer Interaction
CSC 484	User-Centered Interface Design and Development
CSC 486	Human-Computer Interaction Theory and Design
CSC 489	Current Topics in Artificial Intelligence
CSC 490	Selected Advanced Topics ²
CSC 508	Software Engineering I
CSC 509	Software Engineering II
CSC/CPE 515	Computer Architecture
CSC 521	Computer Security
CSC 530	Languages and Translators
CSC 540	Theory of Computation II
CSC 550	Operating Systems
CSC 560	Database Systems
CSC/CPE 564	Computer Networks: Research Topics
CSC 566	Topics in Advanced Data Mining
CSC/CPE 569	Distributed Computing
CSC 570	Current Topics in Computer Science ²
CSC 572	Computer Graphics
CSC 580	Artificial Intelligence

CSC 581	Computer Support for Knowledge Management	
CSC 582	Introduction to Natural Language Processing	
DATA 301	Introduction to Data Science	
Total units		32

¹ Choose from CSC/CPE upper-division courses open to CSC majors. Must be approved via the CSC minor form upon acceptance to the minor.

² Must be approved via the CSC minor form, signed by the minor advisor.

Computing for Interactive Arts Minor

Required Courses

ART 182	Foundation in Digital Art I	4
ART 183	Foundation in Digital Art II	4
ART 384	Digital 3D Modeling and Design	4
CSC/CPE 101	Fundamentals of Computer Science	4
CSC/CPE 202	Data Structures	4
CSC/CPE 203	Project-Based Object-Oriented Programming and Design	4
CSC/ART 350	Computing for Interactive Arts Capstone I	2
CSC/ART 450	Computing for Interactive Arts Capstone II	2

Approved Art and Design Electives

Select from the following: 8

ART 302	Figure Drawing	
ART 334	Illustration I: Techniques and Tools	
ART 383	Digital Video I	
ART 434	Illustration II	
ART 474	Collaborative Studio: Rendering, Animation and Modeling	

Approved Computer Science Electives

Select from the following: 8

CSC 371	Game Design	
CSC 378	Interactive Entertainment Engineering	
CSC 480	Artificial Intelligence	
CSC 481	Knowledge Based Systems	

Total units 44

4. Prepared for life-long learning in the discipline of computer science, including continued formal graduate education.
5. Aware of the impacts of computing technology on society and understand ethics and responsible professional conduct.

The MS degree requires at least 45 units beyond the undergraduate degree. Courses must be chosen according to the following requirements:

Select from the following: 20

CSC 508	Software Engineering I	
CSC 509	Software Engineering II	
CSC 515	Computer Architecture	
CSC 521	Computer Security	
CSC 530	Languages and Translators	
CSC 540	Theory of Computation II	
CSC 550	Operating Systems	
CSC 560	Database Systems	
CSC 564	Computer Networks: Research Topics	
CSC 566	Topics in Advanced Data Mining	
CSC 569	Distributed Computing	
CSC 570	Current Topics in Computer Science	
CSC 572	Computer Graphics	
CSC 580	Artificial Intelligence	
CSC 581	Computer Support for Knowledge Management	
CSC 582	Introduction to Natural Language Processing	

Thesis/Project and Seminar

CSC 590	Thesis Seminar	1
CSC 596	Thesis I	2
CSC 597	Thesis II	3
CSC 599	Thesis III	3

Electives

Selected with Graduate Coordinator approval 16

Total units 45

For further information or advisement students should communicate with the Graduate Coordinator of the Computer Science Department.

MS Computer Science Program Learning Objectives

1. Prepared for successful careers in a computing-related field, including careers that involve positions of technical leadership and advanced responsibility
2. Exposed to a broad range of computer-science subjects in coursework that emphasizes technical subject matter.
3. Able to perform, analyze, evaluate and synthesize computer science research, in particular, know how to present research findings in oral and written form.

Electrical Engineering

Engineering East Bldg. (20A), Room 200
Phone: 805.756.2781
www.ee.calpoly.edu

Department Chair: Dennis Derickson

College of Engineering Advising Center
Engineering South (40), Room 114
Phone: 805.756.1461

Academic Programs

Program name	Program type
Computer Engineering	BS
Electrical Engineering	BS, MS

The Electrical Engineering Department offers a Bachelor of Science degree and a Master of Science degree in Electrical Engineering, and supports the Bachelor of Science degree in Computer Engineering. Both undergraduate degrees are accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

The mission of the Electrical Engineering Department is to educate students to achieve excellence in the discipline of electrical engineering and to teach them to apply their education to solve practical problems in a socially responsible way. Students are prepared for careers of service, leadership, and distinction in a wide range of engineering and other related fields using a participatory, learn-by-doing, and "hands-on" laboratory, project, and design centered approach. Students are encouraged to participate in lifelong learning as essential in the presence of the ever-increasing pace of technological change.

Diversity in the students, faculty and staff is embraced and enhances the quality and creativity of the campus experience and environment.

The primary educational objectives of the Electrical Engineering program are to prepare graduates to:

1. Excel in the electrical engineering profession;
2. Embrace life-long learning as a necessary component to remain current in their profession; and
3. Pursue graduate degrees for enhanced skills and opportunities.

The Electrical Engineering degree programs prepare graduates for distinguished practice in professional engineering; equipping students for pursuing engineering solutions to urgent problems while being responsibly aware of all implications. To that end, the curriculum provides a sound theoretical background along with current, practical engineering knowledge. Cal Poly's "learn by doing" philosophy is emphasized by integrating design throughout the curriculum in numerous design-centered laboratories that provide students with hands-on experiences in design synthesis, analysis, characterization, and verification.

The student begins the major in the first quarter with an orientation class and laboratory; and generally has one or more major courses each quarter until graduation. The many laboratory courses provide practical experience and lead logically from demonstration of theory into design applications.

During their junior and senior years, students choose technical electives to gain additional expertise in one or more areas of specialization

within electrical engineering. These courses deal with the development, design and application of circuits, electronic devices, computers, and systems for communication, controls, information processing and display, and system instrumentation. Senior courses in this area provide specialized preparation in a selected area such as active and passive network synthesis, advanced communications systems, computer system design, microelectronic circuit engineering, microprocessor systems applications, microwave engineering, photonics, biomedical instrumentation, integrated circuits, and solid state devices.

Other courses deal with industrial process control systems, power electronics, and with generation, distribution, control and utilization of electric power. Senior elective courses in this area provide specialized preparation in a selected area such as advanced control systems, energy conversion, power system analysis, protection and stability, and solid state motor control.

Employers recognize that students who have completed such specialized technical courses are early contributors in the workforce. Students wishing to pursue graduate work may select appropriate senior courses in keeping with this goal.

In the required senior design project, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to solve practical problems.

Involvement in faculty research is possible for graduate students and outstanding undergraduate students. Research areas include computer-aided education, automotive and transportation applications, signal and image processing, electric vehicles, computer architecture and software systems, photonics, polymer electronics, power systems, power electronics, radio frequency electronics, communication systems, biomedical electronics, and electric power quality.

Students are encouraged to participate in professional organizations and clubs such as: Institute of Electrical and Electronics Engineers (IEEE), IEEE Computer Society (IEEE-CS), IEEE Consumer Electronics Society (IEEE-CES), IEEE Power and Energy Society (IEEE-PES), Audio Engineering Society (AES), Cal Poly Robotics, Electric Vehicle Club, Renewable Energy Club, Society of Automotive Engineers (SAE) and the Formula Electric challenge, Society of Women Engineers (SWE), Women involved in Software & Hardware (WISH), Eta Kappa Nu (HKN), Society of Photo-Optical Instrumentation Engineers (SPIE), Student Electrical Engineering Council (SEEC), and the Amateur Radio Club. The Electric Power Institute, sponsored by the university and underwritten by major utility companies and electrical equipment manufacturers, offers advanced seminars and lectures in the electrical power field and facilitates student and faculty interaction with industry.

Undergraduate Programs

BS Computer Engineering

This program is jointly offered by the Computer Science Department and the Electrical Engineering Department. For information regarding this program, please refer to Computer Engineering (p. 216).

BS Electrical Engineering

Students are prepared for careers of service, leadership, and distinction in engineering and other related fields using a participatory, learn-by-doing, and "hands-on" laboratory, project, and design centered approach. Students are encouraged to participate in lifelong learning in the presence of rapid technological change.

Graduate Program MS Electrical Engineering

General Characteristics

The Master of Science program in Electrical Engineering serves students and practicing engineers seeking:

- Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and managerial engineering;
- Updating and upgrading opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree;
- A base which allows graduates to maintain currency in their fields.

Prerequisites

For admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit satisfactory scores for the General (Aptitude) Test of the Graduate Record Examination. Foreign applicants must have satisfactory scores on the TOEFL and TWE exams. An applicant who meets these standards but lacks prerequisite coursework may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Graduate Coordinator, Electrical Engineering Department.

Program of Study

Graduate students in this program must file a formal study plan with their advisor, department, college and university graduate studies office by no later than the end of the second quarter in the program. The formal program of study must include a minimum of 45 units (at least 28 of which must be at the 500 level and the remainder at the 400 level).

The broad curriculum requirements for the MS in Electrical Engineering are:

1. core of 16 units;
2. a minimum of 12 units of additional electrical engineering courses;
3. at least 17 units of approved electives;
4. at least 28 units of the 45 unit program at the 500 level.

Two program options are available for MS in Electrical Engineering students: a thesis program which requires coursework, a thesis and oral defense of thesis; or a nonthesis option which involves additional coursework and a comprehensive examination. The thesis option is strongly encouraged for all students.

Blended BS + MS Electrical Engineering Honors Program

The blended program is an honors program that provides a means for academically excellent students to complete the MS Electrical Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to

graduate status; embarking on their graduate coursework while they complete their undergraduate degree requirements.

Eligibility

Students majoring in BS Electrical Engineering or Computer Engineering may be eligible to pursue the blended program after completing all required EE/CPE 300-level courses. Participation in the program is based on prior academic performance and other measures of professional promise. Students are selected by the Graduate Committee. See Graduate Programs (p. 412) for the minimum university eligibility criteria; contact the EE Department for specific program eligibility criteria.

Program of Study

The unit requirements for either the BS or MS degree are unchanged in the blended program. Students in the program are required to complete a thesis. When all requirements are met for both the undergraduate and graduate programs, both degrees are awarded at the same time. If a student fails to complete the MS program requirements, then the BS degree may be granted when all requirements for that degree are met.

BS Electrical Engineering Program Learning Outcomes

Electrical engineering students are expected to graduate with:

1. An ability to apply knowledge of mathematics, science, and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulate, and solve engineering problems
6. An understanding of professional and ethical responsibility
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. A recognition of the need for, and an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
12. A knowledge of probability and statistics, including applications appropriate to the electrical engineering field
13. A knowledge of mathematics through differential and integral calculus, basic sciences, and engineering sciences necessary to analyze and design complex devices and systems containing hardware and software components; and
14. A knowledge of advanced mathematics, typically including differential equations, linear algebra, complex variables, and discrete mathematics.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

CPE/EE 133	Digital Design	4
CPE/EE 233	Computer Design and Assembly Language Programming	4
EE 111 & EE 151	Introduction to Electrical Engineering and Introduction to Electrical Engineering Laboratory	2
EE 112	Electric Circuit Analysis I	2
EE 211 & EE 241	Electric Circuit Analysis II and Electric Circuit Analysis Laboratory II	4
EE 212 & EE 242	Electric Circuit Analysis III and Electric Circuit Analysis Laboratory III	4
EE 228	Continuous-Time Signals and Systems	4
EE 255 & EE 295	Energy Conversion Electromagnetics and Energy Conversion Electromagnetics Laboratory	4
EE 302 & EE 342	Classical Control Systems and Classical Control Systems Laboratory	4
EE 306 & EE 346	Semiconductor Device Electronics and Semiconductor Device Electronics Laboratory	4
EE 307 & EE 347	Digital Electronics and Integrated Circuits and Digital Electronics and Integrated Circuits Laboratory	4
EE 308 & EE 348	Analog Electronics and Integrated Circuits and Analog Electronics and Integrated Circuits Laboratory	4
EE 314	Introduction to Communication Systems	3
EE 328 & EE 368	Discrete Time Signals and Systems and Signals and Systems Laboratory	4
EE/CPE 329 or EE 336	Programmable Logic and Microprocessor-Based Systems Design or Microprocessor System Design	4
EE 335	Electromagnetic Fields and Transmission	4
EE 375	Electromagnetic Fields and Transmission Laboratory	1
EE 402	Electromagnetic Waves	4

EE 409 & EE 449	Electronic Design and Electronic Design Laboratory	4
EE 460	Senior Project Preparation ⁸	2
Select from the following: ⁸		4
EE 461 & EE 462	Senior Project I and Senior Project II	
EE 462 & EE 463	Senior Project II and Senior Project Design Laboratory I	
Technical Electives ^{1,6}		11
Select from the following: ²		
EE Senior Design Lecture/Laboratory electives		
EE 410	Power Electronics I	
EE 411	Power Electronics II	
EE 413	Advanced Electronic Design	
EE 417	Alternating Current Machines	
EE 420	Sustainable Electric Energy Conversion	
EE 424	Introduction to Remote Sensing	
EE/CPE 428	Computer Vision	
EE 431/CPE 441	Computer-Aided Design of VLSI Devices	
EE 433	Introduction to Magnetic Design	
EE 434	Automotive Engineering for a Sustainable Future	
EE/CPE 439	Introduction to Real-Time Embedded Systems	
EE/BRAE 450	Solar Photovoltaic System Engineering	
EE 495	Cooperative Education Experience ³	
EE 516	Pattern Recognition	
EE/CPE 521	Computer Systems	
EE/CPE 522	Advanced Real-Time Embedded Systems Design	
EE/CPE 523	Digital Systems Design	
EE Senior Design Lecture Electives		
EE 400	Special Problems ⁴	
EE 403	Fiber Optic Communication	
EE 405	High Frequency Amplifier Design	
EE 406	Power Systems Analysis I	
EE 407	Power Systems Analysis II	
EE 412	Advanced Analog Circuits	
EE 415	Communication Systems Design	
EE 416	Digital Communication Systems	
EE 418	Photonic Engineering	
EE 419	Digital Signal Processing	
EE 423/ BMED 434/ MATE 430	Micro/Nano Fabrication	
EE 425	Analog Filter Design	
EE/CPE 432	Digital Control Systems	
EE 440	Wireless Communications	
EE 470	Selected Advanced Topics	
EE 502	Microwave Engineering	

EE 509	Computational Intelligence
EE 511	Electric Machines Theory
EE 513	Control Systems Theory
EE 514	Advanced Topics in Automatic Control
EE 515	Discrete Time Filters
EE 518	Power System Protection
EE 519	Advanced Analysis of Power Systems
EE 520	Solar-Photovoltaic Systems Design
EE 524	Solid State Electronics
EE 526	Advanced Digital Communications
EE 527	Advanced Topics in Power Electronics
EE 528	Digital Image Processing
EE 529	Microwave Device Electronics
EE 530	Fourier Optics
EE 533	Antennas
EE 570	Selected Advanced Topics
EE Senior Design Laboratory Electives	
EE 400	Special Problems ⁴
EE/PHYS 422	Polymer Electronics Laboratory
EE 443	Fiber Optics Laboratory
EE 444	Power Systems Laboratory
EE 445	High Frequency Amplifier Design Laboratory
EE 452	Advanced Analog Circuits Laboratory
EE 455	Analog Filter Design Laboratory
EE 456	Digital Communication Systems Laboratory
EE 458	Photonic Engineering Laboratory
EE 459	Digital Signal Processing Laboratory
EE 471	Selected Advanced Laboratory
EE/CPE 472	Digital Control Systems Laboratory
EE 480	Wireless Communications Laboratory
EE 541	Advanced Microwave Laboratory
EE 544	Solid-state Electronics and VLSI Laboratory
Non-EE Electives	
BMED 420	Principles of Biomaterials Design
BMED 425	Biomedical Engineering Transport
BMED 430	Biomedical Modeling and Simulation
BMED/MATE 435	Microfabrication Laboratory
BMED 440	Bioelectronics and Instrumentation
BMED 445	Biopotential Instrumentation
BUS 311	Managing Technology in the International Legal Environment
CHEM 313	Survey of Biochemistry and Biotechnology
CPE 315	Computer Architecture
CPE 416	Autonomous Mobile Robotics
ECON 330	International Trade Theory
ECON 337	Money, Banking and Credit

ENVE 331	Introduction to Environmental Engineering	
IME 301	Operations Research I	
IME 303	Project Organization and Management	
IME 305	Operations Research II	
IME 319	Human Factors Engineering	
IME/HNRS 322	Leadership and Project Management	
IME 401	Sales Engineering	
IME 435	Reliability for Design and Testing	
IME 457	Advanced Electronic Manufacturing	
IME/MATE 458/ CPE 488	Microelectronics and Electronics Packaging	
MATE 340	Electronic Materials Systems	
MATH 304	Vector Analysis	
MATH 408	Complex Analysis I	
MATH 409	Complex Analysis II	
MATH 451	Numerical Analysis I	
MATH 452	Numerical Analysis II	
ME 302	Thermodynamics I	
ME 405	Mechatronics	
ME 415	Energy Conversion	
MU 311	Sound Design: Technologies	
MU 312	Sound Design: Recording	
MU 411	Sound Design: Synthesis	
PHYS 302	Classical Mechanics I	
PHYS 303	Classical Mechanics II	
PHYS 310	Physics of Energy	
PHYS 313	Introduction to Atmospheric Physics	
PHYS 318	Special Theory of Relativity	
PHYS 322	Vibrations and Waves	
PHYS 403	Particle and Nuclear Physics	
PHYS 405	Quantum Mechanics I	
PHYS 406	Quantum Mechanics II	
PHYS 408	Electromagnetic Fields and Waves I	
PHYS 409	Electromagnetic Fields and Waves II	
PHYS 412	Solid State Physics	
PHYS 417	Nonlinear Dynamical Systems	
PHYS 423	Advanced Optics	
PHYS 452	Solid State Physics Laboratory	
SUPPORT COURSES		
BIO 213 & BMED 213	Life Science for Engineers and Bioengineering Fundamentals (B2) ⁵	4
CHEM 124	General Chemistry for Physical Science and Engineering I (B3/B4) ⁵	4
CSC/CPE 101	Fundamentals of Computer Science	4
ENGL 149	Technical Writing for Engineers (A3) ⁵	4
IME 156 or IME 157	Basic Electronics Manufacturing Electronics Manufacturing	2-4
MATH 141	Calculus I (B1) ⁵	4
MATH 142	Calculus II (B1) ⁵	4
MATH 143	Calculus III (Add'l Area B) ⁵	4

MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
PHYS 141	General Physics IA (Add'l Area B) ⁵	4
PHYS 132	General Physics II	4
PHYS 133	General Physics III	4
PHYS 211	Modern Physics I	4
STAT 350	Probability and Random Processes for Engineers (B6) ⁵	4
Approved engineering support electives ^{1, 6, 7}		9
Select from the following:		
BIO 111	General Biology	
BMED 212	Introduction to Biomedical Engineering Design	
BMED 310	Biomedical Engineering Measurement and Analysis	
BMED 450	Contemporary Issues in Biomedical Engineering	
CHEM 125	General Chemistry for Physical Science and Engineering II	
CHEM 212	Introduction to Organic Chemistry	
CHEM 313	Survey of Biochemistry and Biotechnology	
CPE 290	Selected Topics (Introduction to C++ Programming)	
CPE 315	Computer Architecture	
CSC/CPE 202	Data Structures	
CSC/CPE 203	Project-Based Object-Oriented Programming and Design	
CSC 348	Discrete Structures	
EE/PHYS 422	Polymer Electronics Laboratory	
IME 142	Manufacturing Processes: Materials Joining	
IME 143	Manufacturing Processes: Material Removal	
IME 301	Operations Research I	
IME 305	Operations Research II	
IME 314	Engineering Economics	
MATE 210	Materials Engineering	
MATE 215	Materials Laboratory I	
MATE 232	Materials, Ethics, and Society	
MATE 430/ BMED 434	Micro/Nano Fabrication	
MATE/BMED 435	Microfabrication Laboratory	
MATH 206	Linear Algebra I	
MATH 304	Vector Analysis	
MATH 408	Complex Analysis I	
MATH 409	Complex Analysis II	
MATH 451	Numerical Analysis I	
MATH 452	Numerical Analysis II	
MATH 453	Numerical Optimization	
ME 211	Engineering Statics	
ME 212	Engineering Dynamics	
ME 302	Thermodynamics I	
ME 341	Fluid Mechanics I	

PHYS 212	Modern Physics II
PHYS 310	Physics of Energy
PHYS 313	Introduction to Atmospheric Physics
PHYS 315	Introduction to Lasers and Laser Applications
PHYS 318	Special Theory of Relativity
PHYS 322	Vibrations and Waves
PHYS 323	Optics
PHYS 403	Particle and Nuclear Physics
PHYS 405	Quantum Mechanics I
PHYS 406	Quantum Mechanics II
PHYS 408	Electromagnetic Fields and Waves I
PHYS 409	Electromagnetic Fields and Waves II
PHYS 412	Solid State Physics
PHYS 417	Nonlinear Dynamical Systems
PHYS 423	Advanced Optics
PHYS 424	Theoretical Physics
PHYS 452	Solid State Physics Laboratory

GENERAL EDUCATION (GE)

(See GE program requirements below.) 40

FREE ELECTIVES

Free Electives 0

Total units 192-194

- ¹ Consultation with advisor is recommended prior to selecting technical electives or approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
- ² A minimum of two EE Senior Design Lecture Electives and two EE Senior Design Laboratory Electives.
- ³ Taken Fall 2009 or later; four units maximum.
- ⁴ Four units maximum may count toward technical electives; one unit maximum, with approval of department chair, may count towards senior design laboratory elective.
- ⁵ Required in Support; also satisfies GE.
- ⁶ No course credits may be used simultaneously to satisfy both engineering support and technical elective requirements.
- ⁷ The number of units given for transfer credit will not exceed the number of units of the Cal Poly course.
- ⁸ ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for the series EE 460, EE 461 and EE 462 (6) or the series EE 460, EE 463 and EE 464 (6).

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics	

B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		40

¹ Required in Support; also satisfies GE

MS Electrical Engineering Program Learning Objectives

Our goal is to create a graduate degree program and a learning environment that result in graduates who possess the following:

1. Technical competency in their chosen disciplines;
2. Effective communication skills;
3. Awareness of the impacts of technology on society and the environment;
4. Understanding of ethics and responsible professional conduct;
5. Strong interpersonal and teamwork skills;
6. Appreciation of the need for life-long learning;
7. Leadership/planning/decision-making skills;
8. Critical thinking/complex problem-solving skills.

Required Courses

EE 525	Stochastic Processes	4
or EE 513	Control Systems Theory	
EE 563	Graduate Seminar (1, 1, 1)	3
EE 599	Design Project (Thesis) (or 9 units of approved Technical Electives and a comprehensive written examination)	9

Additional Electrical Engineering Graduate Courses

Select from the following: ¹		12
EE 502	Microwave Engineering	
EE 509	Computational Intelligence	
EE 511	Electric Machines Theory	
EE 513	Control Systems Theory	

EE 514	Advanced Topics in Automatic Control	
EE 515	Discrete Time Filters	
EE 518	Power System Protection	
EE 519	Advanced Analysis of Power Systems	
EE 520	Solar-Photovoltaic Systems Design	
EE 521	Computer Systems	
EE 522	Advanced Real-Time Embedded Systems Design	
EE 523	Digital Systems Design	
EE 524	Solid State Electronics	
EE 526	Advanced Digital Communications	
EE 527	Advanced Topics in Power Electronics	
EE 528	Digital Image Processing	
EE 529	Microwave Device Electronics	
EE 530	Fourier Optics	
EE 533	Antennas	
EE 541	Advanced Microwave Laboratory	
EE 544	Solid-state Electronics and VLSI Laboratory	

Approved Technical Electives (400-500 level)

May be selected from the course list above and other advisor approved technical electives.

Total units 45

¹ Not all courses listed are offered each academic year. Consult the EE Department for current information on course offerings.

General Engineering

Engineering Bldg. (13), Room 263
Phone: 805.756.6339

College of Engineering Advising Center

Engineering South (40), Room 111
Phone: 805.756.1461
gene@calpoly.edu
<http://gene.calpoly.edu/>

Academic Programs

Program	Classification
General Engineering	BS

General Engineering

The mission of the General Engineering Program is to provide students with the highest quality technical and professional engineering education, with a particular emphasis in new or evolving interdisciplinary areas, while allowing the student to participate in designing their curricula.

BS General Engineering

Flexibility, core competency and self-determination are the keywords for students of the General Engineering Program. The mission of the General Engineering Program is to provide students with the highest quality technical and professional engineering education, with a particular emphasis in new or evolving interdisciplinary areas, while allowing the students to participate in designing their curricula. General Engineering graduates have used this program as a foundation for advanced studies and careers in education, project management, technical sales, law, entrepreneurship, medicine and a hundred other paths defined by their keen intellects and adventuresome spirits.

The primary goal of the General Engineering Program is to provide students with a theoretically rigorous and a laboratory-centered, practice-oriented, hands-on education that allows graduates to immediately participate and to excel in professional environments. The program is underpinned by a rigorous selection of mathematics, science, basic engineering and liberal-arts courses. There are two paths in the General Engineering program: the General Curriculum in General Engineering, which provides a broad, but rigorous, undergraduate course of study, and the Individualized Course of Study, in which students, with their advisors, select forty technical elective classes that allow the students to put their own mark on their degrees, ensuring a unique competency with a solid underpinning.

General Engineering graduates are ready for immediate entry into the professional engineering field. They demonstrate an ability to satisfy their personal needs for further education, as expressed in their matriculation to graduate or professional schools in many cases, and an interest in life-long learning in all cases. They possess a solid engineering foundation which underpins a successful career. They can become leaders, based on strong communication skills, a capacity to form teams and perform in teams, and an understanding of the economic and social impact of their decisions.

In addition to the abilities expected of all engineering graduates, articulated in the section of this catalog describing the College of

Engineering, General Engineering graduates are expected to leave the University with special capabilities pertinent to their own concentrations.

The *General Curriculum in General Engineering* is designed to provide the broad foundation of engineering competency in preparation for further graduate/professional studies, engineering careers requiring a breadth of knowledge, and non-engineering careers benefiting from a broad technical background. The *Individualized Course of Study* is designed to allow students the latitude in course selection required to educate themselves either in the classical study of engineering or in new and evolving interdisciplinary technologies. Both the General Curriculum in General Engineering and the Individualized Course of Study are excellent preparation for an applied terminal masters degree in interdisciplinary fields such as the Blended BS+MS program described in the MS Engineering section of this catalog. General Engineering can also accommodate those students who wish to major in engineering but have not presently decided in which specific program their interest is centered. The curriculum builds a sound foundation in the fundamental principles of engineering and engineering systems during the early years of study. During their final quarters of study, students customize their study plan with the help of a faculty advisor and are given the opportunity to focus their education while still at the undergraduate level. The BS degree in General Engineering is, therefore, a direct path to employment in a classic engineering field or in an area of emerging technology. It is also a natural step toward a professional or a graduate degree.

General Engineering students are encouraged to participate in the Blended BS+MS program. This program recognizes that the expertise required of entry level engineers in many fields, particularly new and evolving technological fields, implies that a masters degree is a prerequisite for success. The program allows motivated students to reduce the time necessary to earn both degrees.

All practitioners of engineering must have an understanding of the physical sciences and mathematics. Further, they must have a firm grasp of engineering sciences. The General Engineering curriculum provides the framework for this matrix of understanding, upon which the practitioner may begin to develop a unique area of expertise.

The Individualized Course of Study is available to students who have completed their Sophomore year in any engineering major. This program is for directed, highly motivated students. The technical elective courses are selected to be consistent with a sharply defined career goal. Each student is required to submit a study plan to the coordinator prior to the end of the first quarter of their junior year. Study plans selected in the past have emphasized engineering physics, management of technology, bioengineering, ocean engineering and engineering in unique environments.

General Curriculum in General Engineering or Individualized Course of Study

General Curriculum

The General Engineering Curriculum in General Engineering is designed to meet the needs of students interested in a broad, but rigorous, undergraduate course of study. Students will primarily use this degree as preparation for further graduate/professional studies (e.g. engineering, law, business), engineering careers requiring breadth, and non-engineering careers benefiting from a broad technical background (e.g. education, entrepreneurship, non-profit organizations).

BS General Engineering

Program Learning Outcomes

1. An ability to apply knowledge of mathematics, science, and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulate, and solve engineering problems
6. An understanding of professional and ethical responsibility
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. A recognition of the need for, and an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

CE 204	Mechanics of Materials I	3
CSC/CPE 101	Fundamentals of Computer Science ¹	4
EE 201 & EE 251	Electric Circuit Theory and Electric Circuits Laboratory	4
ENGR 110	Introduction to Engineering	2
IME 144	Introduction to Design and Manufacturing	4
IME 314	Engineering Economics	3
MATE 210 & MATE 215	Materials Engineering and Materials Laboratory I	4
ME 211	Engineering Statics	3
ME 212	Engineering Dynamics	3
ME 302	Thermodynamics I	3
ME 341	Fluid Mechanics I	3
Select from the following:		4
ME 350	Heat Transfer	
Or		
MATE 325	Transport Phenomena I	

MATE 326	Transport Phenomena II	
MATE 327	Transport Phenomena III	
And 1 additional unit of an upper-division Technical Elective		
Select from the following:		6
ENGR 459	Interdisciplinary Senior Design Project I	
ENGR 460	Interdisciplinary Senior Design Project II	
ENGR 461	Interdisciplinary Senior Design Project III	
Or		
Senior Project in appropriate engineering discipline		
General Curriculum in General Engineering or Individualized Course of Study ²		40
SUPPORT COURSES		
BIO 213	Life Science for Engineers	2
BMED/BRAE 213	Bioengineering Fundamentals (B2) ³	2
Select from the following:		8
CHEM 124 & CHEM 125	General Chemistry for Physical Science and Engineering I and General Chemistry for Physical Science and Engineering II (B3/B4) ³	
CHEM 127 & CHEM 128	General Chemistry for Agriculture and Life Science I and General Chemistry for Agriculture and Life Science II (B3/B4) ³	
ENGL 149	Technical Writing for Engineers (A3) ³	4
MATH 141 & MATH 142	Calculus I and Calculus II (B1) ³	8
MATH 143	Calculus III (Add'l Area B) ³	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
Select from the following:		4
MATH 344	Linear Analysis II	
STAT 312	Statistical Methods for Engineers	
STAT 350	Probability and Random Processes for Engineers (B6) ³	
PHYS 141	General Physics IA (Add'l Area B)	4
PHYS 132 & PHYS 133	General Physics II and General Physics III	8
Physical Science Electives		
Select from the following: ⁴		8
CHEM 126	General Chemistry for Physical Science and Engineering III	
or CHEM 129	General Chemistry for Agriculture and Life Science III	
CHEM 216	Organic Chemistry I	
CHEM 217	Organic Chemistry II	
CHEM 220	Organic Chemistry Laboratory For Life Sciences II	
or CHEM 221	Organic Chemistry Laboratory II	
CHEM 312	Survey of Organic Chemistry	
CHEM 313	Survey of Biochemistry and Biotechnology	

GEOL 102	Introduction to Geology	
GEOL 201	Physical Geology	
GEOL 205	Earthquakes	
GEOL 241	Physical Geology Laboratory	
GEOL 305	Fundamentals of Seismology	
PHYS 107	Introduction to Meteorology	
PHYS 211	Modern Physics I	
PHYS 212	Modern Physics II	
PHYS 323	Optics	
PHYS 417	Nonlinear Dynamical Systems	
GENERAL EDUCATION		
(See GE program requirements below.)		40
FREE ELECTIVES		
Free Electives		0
Total units		186

- ¹ Students with an approved individualized course of study may substitute CSC 231, a 2-unit course, with 2 units of other advisor approved coursework.
- ² The individualized course of study consists of 40 units of technical electives with a minimum of 33 units at the 300-400 level.
- ³ Required in Support; also satisfies GE.
- ⁴ Students in the general curriculum in General Engineering should choose a minimum of 3 units of 300-400 level physical science electives in order to meet 60 units of upper division required for the degree.

General Curriculum in BS General Engineering or Individualized Course of Study (Select one)

General Curriculum in General Engineering (p. 239) Individualized Course of Study

Available to students who have completed their Sophomore year in any engineering major. This program is for directed, highly motivated students. Permits students to pursue a course of study which meets their individual needs and interests. The individualized course of study consists of 40 units of technical electives with a minimum of 33 units at the 300-400 level. Courses are selected by the student with the advice and approval of the student's academic advisor and department chair.

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A		Communication	
A1	Expository Writing		4
A2	Oral Communication		4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹		0
Area B		Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹		0

B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in major)		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		40

¹ Required in Support; also satisfies GE

General Curriculum in General Engineering

CE 207	Mechanics of Materials II	2
CPE/EE 133	Digital Design	4
CPE/CSC 202	Data Structures	4
CPE/EE 329	Programmable Logic and Microprocessor-Based Systems Design	4
or IME 356	Manufacturing Automation	
or ME 305	Introduction to Mechatronics	
EE 321	Electronics	4
& EE 361	and Electronics Laboratory	
IME 418	Product-Process Design	4
Approved Electives (300-level or higher)		18
Total units		40

Industrial & Manufacturing Engineering

Engineering IV Bldg. (192), Room 223
Phone: 805.756.2341
<https://ime.calpoly.edu>

Department Chair: Dan Waldorf

College of Engineering Advising Center
Engineering South (40), Room 114
Phone: 805.756.1461

Academic Programs

Program name	Program type
Engineering Management	MBA/MS
Industrial Engineering	BS, MS
Manufacturing Engineering	BS

The mission of the Industrial Engineering and Manufacturing Engineering programs at Cal Poly is inspire and educate students for successful careers as engineering professionals using a learn-by-doing approach that develops students' abilities to design and implement innovative, effective solutions for improving processes and systems in society, business, and industry.

The Department focuses on programs that integrate engineering with a real concern for people. Our students study topics that lead to satisfying and productive careers, and also provide strong preparation for graduate work in many fields. Programs reflect the traditional strengths of Cal Poly through close interaction between students and faculty in classroom, laboratory, and other activities. The programs use a project based learning approach where students work on multiple real life projects. Students often present results to industry representatives.

Department and university laboratories and computers are integrated into coursework to investigate, test, and apply theoretical principles learned in the classroom. The descriptions below provide details of the various programs.

Undergraduate Programs

BS Industrial Engineering

Industrial Engineering is the profession concerned with solving integrated engineering and management problems. According to the Institute of Industrial and Systems Engineers, "Industrial engineers figure out how to do things better. They engineer processes and systems that improve quality and productivity. They work to eliminate waste of time, money, materials, energy and other commodities. This is why many industrial engineers end up being promoted into management positions." Key objectives of industrial engineering are to improve the quality and productivity of creating and delivering goods and services and to act as the interface between technology and humans. Engineering methods and practical knowledge are used in formulating decision models for the optimum application of engineering and management principles.

The Bachelor of Science program in Industrial Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.ABET.org>. The following objectives have been set for students completing the Industrial Engineering program:

1. *Immediate Practice* – Graduates will make immediate contributions to the practice of industrial engineering or a related field by their demonstrated knowledge of contemporary issues and direct, hands-on experience with the modern tools and techniques of the discipline.
2. *Solid Engineering Foundations* – Graduates will have successful careers based on their ability to solve problems and make improvements through engineering design, experimentation, and application of scientific principles as well as their ability to analyze and critically evaluate solutions.
3. *Broad Education* – Graduates will have careers of distinction and leadership based on their ability to communicate effectively, to contribute meaningfully to a team effort, and to understand the economic, societal, and ethical impacts of their decisions.
4. *Life-Long Learning* – Graduates will demonstrate the ability and desire to follow a life-long pursuit of personal fulfillment through education.

Our main focus is to prepare graduates for practice in professional engineering. Thus, our "learn by doing" philosophy is emphasized in the curriculum by the large number of design-centered laboratories, integrating design throughout the curriculum, and the senior design project experience. In the required senior design project, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems. Graduates can choose from a challenging range of career activities: operations research and analysis, production planning and scheduling, plant design, management, human factors engineering design, data processing and analytics, measurement, quality control and reliability assurance, technical economic planning, resource conservation, productivity measurement, increasing productivity using computer integrated manufacturing techniques, robotics, and, in general, systems analysis and design. The physical, engineering, and social sciences form the broad base for these endeavors.

The program is oriented to provide graduates with the capability of producing results with a minimum of additional training. Computer and hi-tech firms, health care and biomedical industries, aerospace/defense, entertainment, retail chains, farms, airlines, automotive, as well as government, service firms, traditional manufacturing industries, and consulting firms all employ graduates of this discipline. Graduates also are well prepared for successful graduate study.

BS Manufacturing Engineering

Manufacturing Engineering is the profession that applies engineering analysis and methods to the production of all manufactured goods and services. The manufacturing engineer plans, develops, and optimizes the processes of production including methods of manufacture, and designs of tools and equipment for manufacturing. The emphasis is on both development and sustained operation of manufacturing systems, including computer-aided methods, automation, design for manufacture, production tooling, and material handling, as well as the processes and ancillary support systems of modern manufacturing.

The Bachelor of Science program in Manufacturing Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.ABET.org>. The following objectives have been set for students completing the Manufacturing Engineering Program at Cal Poly:

1. *Immediate Practice*. Graduates will make immediate contributions to the practice of manufacturing engineering or a related field by their demonstrated knowledge of contemporary issues and direct, hands-on experience with the modern tools and techniques of the discipline.

2. *Solid Engineering Foundations* – Graduates will have successful careers based on their demonstrated ability to solve problems and make improvements through engineering design, experimentation, and application of scientific principles as well as their ability to analyze and critically evaluate their decisions.
3. *Broad Education* – Graduates will have careers of distinction and leadership based on their ability to communicate effectively, to contribute meaningfully to a team effort, and to understand the economic and ethical impacts of their decisions.
4. *Life-Long Learning* – Graduates will demonstrate the ability and desire to follow a life-long pursuit of personal fulfillment through education.

In the required senior design project, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems.

Graduates typically work more directly with the manufacturing processes than do industrial engineers.

Emphasis is placed upon application of the basic sciences and engineering fundamentals. Knowledge of basic processes, tool design, automation, and computer-aided manufacturing are applied directly to the problems of development and sustained operation of manufacturing systems.

Graduates are prepared for job-entry at the professional level in the areas of CAD/CAM, process engineering, automation, quality assurance, and production engineering. They also are well prepared for successful graduate study.

Graduate Program

Cal Poly offers an MS Engineering Management interdisciplinary program sponsored by the Orfalea College of Business and the Industrial and Manufacturing Engineering Department. For more information, see the MS Engineering Management (p. 404) section.

MS Industrial Engineering General Characteristics

The Master of Science in Industrial Engineering (MS IE) program is designed to prepare students for a successful career in industry as well as a further study in a Ph.D. program, building on its strength in learn-by-doing and project-based engineering education and focusing on applied research. Through the MS IE program, students will sharpen both technical skills and non-technical skills required for success in their careers.

<https://ime.calpoly.edu/programs/>

Blended BS+MS Engineering Program

Students must be prepared for engineering practice via the curriculum which culminates in a major design experience based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints, as listed in the ABET Engineering Criteria. Therefore, “Blended BS + MS Program” students must complete a senior project with this major design experience requirement in order to complete the undergraduate degree.

Students may be eligible to pursue the blended program toward the MS in Industrial Engineering or the MS Engineering with a specialization in Integrated Technology Management. Please refer to the MS Engineering (p. 192) section of this catalog for more information and General Policies

Governing Graduate Studies (p. 412) for eligibility criteria for blended programs.

BS Industrial Engineering Program Learning Outcomes

1. An ability to apply knowledge of mathematics, science, and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (includes ability to design and develop integrated systems that include people, materials, information, equipment and energy)
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulate, and solve engineering problems (including the ability to improve integrated systems of people, materials, information, equipment, and energy)
6. An understanding of professional and ethical responsibility
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. A recognition of the need for, and an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (includes the ability to integrate systems of people, materials, information, equipment, and energy using appropriate analytical, computational, and experimental practices as well as the ability to implement such systems)

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit. No course may be double counted within the curriculum.

MAJOR COURSES

IME 101	Introduction to Industrial and Manufacturing Engineering	1
IME 140	Graphics Communication and Modeling	2
IME 141	Manufacturing Processes: Net Shape	1
IME 144	Introduction to Design and Manufacturing	4
IME 156	Basic Electronics Manufacturing	2
IME 223	Process Improvement Fundamentals	4
IME 239	Industrial Costs and Controls	3

IME 301	Operations Research I	4	IME 458	Microelectronics and Electronics Packaging	
IME 303	Project Organization and Management	4	IME 460	Introduction to Value Chain Analysis	
IME 305	Operations Research II	4	IME 470	Selected Advanced Topics	
IME 312	Data Management and System Design	4	IME 471	Selected Advanced Laboratory	
IME 314	Engineering Economics	3	IME/AERO 510	Systems Engineering I	
IME 319	Human Factors Engineering	3	IME/AERO 511	Systems Engineering II	
IME 326	Engineering Test Design and Analysis	4	IME 520	Advanced Information Systems for Operations	
IME 410	Production Planning and Control Systems	4	IME 527	Design of Experiments	
IME 417	Supply Chain and Logistics Management	4	IME 541	Advanced Operations Research	
IME 420	Simulation	4	IME 542	Applied Reliability Engineering	
IME 429	Ergonomics Laboratory	1	IME 543	Applied Human Factors	
IME 430	Quality Engineering	4	IME 544	Advanced Topics in Engineering Economy	
IME 443	Facilities Planning and Design	4	IME 545	Advanced Topics in Simulation	
IME 481	Senior Design Project I ^{7,8}	2	MATE 410	Nanoscale Engineering	
IME 482	Senior Design Project II ^{7,8}	3	MATH 344	Linear Analysis II	
Technical Electives ^{2, 3, 4, 5}			MATH 350	Mathematical Software	
Select from the following:		10	ME 302	Thermodynamics I	
AG/ISLA/EDES/ENGR/SCM/UNIV 350	The Global Environment		ME 305	Introduction to Mechatronics	
BUS/ENGR 310	Introduction to Entrepreneurship		ME 341	Fluid Mechanics I	
BUS 311	Managing Technology in the International Legal Environment		PSY 350	Teamwork	
BUS 346	Principles of Marketing		STAT 324	Applied Regression Analysis	
BUS 382	Organizations, People, and Technology		STAT 330	Statistical Computing with SAS	
BUS 402	International Business Management		STAT 331	Statistical Computing with R	
CE 207	Mechanics of Materials II		STAT 416	Statistical Analysis of Time Series	
EE 361	Electronics Laboratory		SUPPORT COURSES		
EE 434	Automotive Engineering for a Sustainable Future		BIO 213 & BMED 213	Life Science for Engineers and Bioengineering Fundamentals (B2) ¹	4
IME 142	Manufacturing Processes: Materials Joining		CE 204	Mechanics of Materials I	3
IME 335	Computer-Aided Manufacturing I		CHEM 124	General Chemistry for Physical Science and Engineering I (B3/B4) ¹	4
IME 356	Manufacturing Automation		CSC 232	Computer Programming for Scientists and Engineers	3
IME 400	Special Problems for Advanced Undergraduates ⁶		EE 201	Electric Circuit Theory	3
IME 401	Sales Engineering		EE 251	Electric Circuits Laboratory	1
IME 408	Systems Engineering		EE 321	Electronics	3
IME 409	Economic Decision Systems		ENGL 149	Technical Writing for Engineers (A3) ¹	4
IME 416	Automation of Industrial Systems		MATE 210	Materials Engineering	3
IME 418	Product-Process Design		MATE 215	Materials Laboratory I	1
IME 424	Industrial Engineering in Healthcare		MATH 141	Calculus I (B1) ¹	4
IME 428	Engineering Metrology		MATH 142	Calculus II (B1) ¹	4
IME 435	Reliability for Design and Testing		MATH 143	Calculus III (Add'l Area B) ¹	4
IME 441	Engineering Supervision I		MATH 241	Calculus IV	4
IME 442	Engineering Supervision II		MATH 244	Linear Analysis I	4
IME 451	Radio Frequency Identification System Design		ME 211	Engineering Statics	3
IME 457	Advanced Electronic Manufacturing		ME 212	Engineering Dynamics	3
			PHYS 132	General Physics II	4
			PHYS 133	General Physics III	4
			PHYS 141	General Physics IA (Add'l Area B) ¹	4
			PSY 201	General Psychology (D4) ¹	4

or PSY 202	General Psychology	
STAT 321	Probability and Statistics for Engineers and Scientists (B6) ¹	4
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		36
FREE ELECTIVES		
Free Electives		0
Total units		190

¹ Required in Support; also satisfies GE.

² Courses meeting technical electives may not be used to satisfy other major, support, or general education requirements (no double counting of coursework).

³ At least 6 units of technical electives must be upper division (300-level or above) engineering or computer science courses.

⁴ A maximum of 4 units of technical electives may be upper division (300-level or above) courses from outside of the College of Engineering or lower division (100 or 200 level) engineering or computer science courses.

⁵ Consultation with advisor is recommended prior to selecting technical electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals. Upper division courses not on this list may substitute as technical electives if approved by advisor and IME department chair.

⁶ IME 400 requires a special problems form and no more than 4 total units are allowed.

⁷ ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for IME 481 and IME 482 (5) with the one excess unit counting towards Technical Electives.

⁸ ENGR 463, ENGR 464 and ENGR 465 (6) may substitute for IME 481 and IME 482 (5) with the one excess unit counting towards Technical Electives.

General Education (GE) Requirements

- 72 units required, 36 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4

C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E) (4 units in Support) ¹	0
Total units		36

¹ Required in Support; also satisfies GE

BS Manufacturing Engineering Program Learning Outcomes

1. An ability to apply knowledge of mathematics, science, and engineering (includes proficiency in materials)
2. An ability to design and conduct experiments, as well as to analyze and interpret data (includes manufacturing laboratory or facility experience, the ability to measure manufacturing process variables and develop technical inferences about the process)
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (includes proficiency in manufacturing processes, the ability to design manufacturing processes that result in products that meet specific material and other requirements; proficiency in process, assembly and product engineering, the ability to design products and the equipment, tooling, and environment necessary for their manufacture; and proficiency in manufacturing systems design, the ability to analyze, synthesize, and control manufacturing operations using statistical methods)
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulate, and solve engineering problems
6. An understanding of professional and ethical responsibility
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (includes manufacturing competitiveness, of the ability to create competitive advantage through manufacturing planning, strategy, quality, and control)
9. A recognition of the need for, and an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirements (GWR)

- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

IME 101	Introduction to Industrial and Manufacturing Engineering	1
IME 140	Graphics Communication and Modeling	2
IME 141	Manufacturing Processes: Net Shape	1
IME 142	Manufacturing Processes: Materials Joining	2
IME 144	Introduction to Design and Manufacturing	4
IME 156	Basic Electronics Manufacturing	2
IME 223	Process Improvement Fundamentals	4
IME 314	Engineering Economics	3
IME 327	Test Design and Analysis in Manufacturing Engineering	4
IME 330	Fundamentals of Manufacturing Engineering	4
IME 335	Computer-Aided Manufacturing I	4
IME 342	Manufacturing Systems Integration	4
IME 356	Manufacturing Automation	4
IME 417	Supply Chain and Logistics Management	4
IME 418	Product-Process Design	4
IME 430	Quality Engineering	4
IME 450	Manufacturing Process and Tool Engineering	4
IME 481	Senior Design Project I ^{6,7}	2
IME 482	Senior Design Project II ^{6,7}	3
Technical Electives ^{2, 3, 4, 5}		
Select from the following:		14
AG/ISLA/EDES/ ENGR/SCM/UNIV 350		
BMED 212	Introduction to Biomedical Engineering Design	
BMED 410	Biomechanics	
BUS/ENGR 310	Introduction to Entrepreneurship	
BUS 311	Managing Technology in the International Legal Environment	
BUS 346	Principles of Marketing	
CE 207	Mechanics of Materials II	
EE 361	Electronics Laboratory	
EE 434	Automotive Engineering for a Sustainable Future	
IME 301	Operations Research I	
IME 303	Project Organization and Management	
IME 305	Operations Research II	
IME 312	Data Management and System Design	
IME 319	Human Factors Engineering	
IME/HNRS 322	Leadership and Project Management	

IME 336	Computer-Aided Manufacturing II
IME 351	Advanced Material Removal Process Design
IME 401	Sales Engineering
IME 408	Systems Engineering
IME 410	Production Planning and Control Systems
IME 416	Automation of Industrial Systems
IME 420	Simulation
IME 421	Manufacturing Organizations
IME 428	Engineering Metrology
IME 429	Ergonomics Laboratory
IME 432	Additive Manufacturing
IME 435	Reliability for Design and Testing
IME 441	Engineering Supervision I
IME 442	Engineering Supervision II
IME 443	Facilities Planning and Design
IME 451	Radio Frequency Identification System Design
IME 457	Advanced Electronic Manufacturing
IME/MATE 458/ CPE 488	Microelectronics and Electronics Packaging
IME 460	Introduction to Value Chain Analysis
IME 470	Selected Advanced Topics
IME 471	Selected Advanced Laboratory
IME/AERO 510	Systems Engineering I
IME/AERO 511	Systems Engineering II
IME 520	Advanced Information Systems for Operations
IME 527	Design of Experiments
IME 541	Advanced Operations Research
IME 542	Applied Reliability Engineering
IME 543	Applied Human Factors
IME 544	Advanced Topics in Engineering Economy
ITP 326	Product Design and Development
ITP 329	Industrial Materials
ITP 330	Packaging Fundamentals
ITP 341	Packaging Polymers and Processing
ITP 371	Supply Chain Management in Manufacturing and Services
ITP 406	Industrial Sales
ITP 428	Commercialization of New Technologies
MATE 410	Nanoscale Engineering
MATE 430	Micro/Nano Fabrication
MATE 440	Welding Metallurgy and Joining of Advanced Materials
MATE 445	Joining of Advanced Materials Laboratory
MATH 344	Linear Analysis II
MATH 350	Mathematical Software
ME 305	Introduction to Mechatronics
ME 341	Fluid Mechanics I

ME 415	Energy Conversion	
SUPPORT COURSES		
BIO 213 & BMED 213	Life Science for Engineers and Bioengineering Fundamentals (B2) ¹	4
CE 204	Mechanics of Materials I	3
CHEM 124	General Chemistry for Physical Science and Engineering I (B3/B4) ¹	4
CHEM 125	General Chemistry for Physical Science and Engineering II	4
CSC 232	Computer Programming for Scientists and Engineers	3
EE 201	Electric Circuit Theory	3
EE 251	Electric Circuits Laboratory	1
EE 321	Electronics	3
ENGL 149	Technical Writing for Engineers (A3) ¹	4
MATE 210	Materials Engineering	3
MATE 215	Materials Laboratory I	1
MATH 141	Calculus I (B1) ¹	4
MATH 142	Calculus II (B1) ¹	4
MATH 143	Calculus III (Add'l Area B) ¹	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
ME 211	Engineering Statics	3
ME 212	Engineering Dynamics	3
ME 302	Thermodynamics I	3
PHYS 132	General Physics II	4
PHYS 133	General Physics III	4
PHYS 141	General Physics IA (Add'l Area B) ¹	4
STAT 321	Probability and Statistics for Engineers and Scientists (B6) ¹	4
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		40
FREE ELECTIVES		
Free Electives		0
Total units		192

¹ Required in Support; also satisfies GE

² The courses selected to satisfy this requirement may not be used to satisfy other major, support, or general education requirements (no double counting of coursework).

³ At least 10 units must be upper level (300-level or above) engineering or computer science courses.

⁴ A maximum of 4 units of technical electives may be upper level (300-level or above) courses from outside of the College of Engineering or lower level (100 or 200 level) engineering or computer science courses.

⁵ Students may take other 300 level or above courses not in the list subject to the approval by advisor and IME department chair. Consultation with advisor is recommended prior to selecting technical electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

⁶ ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for IME 481 and IME 482 (5) with the one excess unit counting towards Technical Electives.

⁷ ENGR 463, ENGR 464 and ENGR 465 (6) may substitute for IME 481 and IME 482 (5) with the one excess unit counting towards Technical Electives.

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		40

¹ Required in Support; also satisfies GE

MS Industrial Engineering Program Learning Outcomes

After successfully completing the requirements of the Master of Science in Industrial Engineering, students will be able to:

1. Summarize and synthesize state-of-the art knowledge in a selected topic in the field of Industrial and Manufacturing Engineering.
2. Apply scientific methods to investigate industry-driven research projects (problem articulation; hypothesis formulation; data collection, management, and analysis; implementation and dissemination of results).
3. Make data-driven engineering decisions.
4. Communicate appropriate information in both written and oral format, based on the audience setting and audience's background.

5. Work productively, respectfully, and professionally as a member of a team; exhibit leadership, ethical conduct, and community values.

The MS IE program has flexible curriculum allowing the student a wide choice in course selection. The program requires a minimum 45 quarter credits of course work in the 400 or 500 level. Of the 45 units, 22 are technical electives. Student can choose technical elective courses from the Industrial and Manufacturing Engineering (IME) department as well as outside the IME department. Flexibility is emphasized so that the student and his/her advisor can structure a degree plan tailored to the individual needs of the student. Only those letter-graded courses count toward satisfying the total unit requirement for the degree. Courses on a credit/no credit basis are not allowed in the formal study plan. No audit credits are permitted.

The MS IE program requires a thesis; the student's thesis topic must be approved by his/her graduate committee, consisting of three committee members. Both an oral defense and a written thesis are required. The thesis will be reviewed by the Graduate Education Office and published at the Digital Commons.

Required Courses

IME 503	Applied Statistical Methods in Engineering ¹	4
IME 507	Graduate Seminar	2
IME 556	Technological Project Management ²	4
IME 580	Manufacturing Systems ³	4
IME 599	Thesis	9

Approved Electives

Select from the following ⁴		22
IME 500	Individual Study	
IME/AERO 510	Systems Engineering I	
IME/AERO 511	Systems Engineering II	
IME 520	Advanced Information Systems for Operations	
IME 527	Design of Experiments	
IME 541	Advanced Operations Research	
IME 542	Applied Reliability Engineering	
IME 543	Applied Human Factors	
IME 544	Advanced Topics in Engineering Economy	
IME 545	Advanced Topics in Simulation	
IME 570	Selected Advanced Topics	
IME 571	Selected Advanced Laboratory	
IME 577	Engineering Entrepreneurship	
STAT 416	Statistical Analysis of Time Series	
STAT 418	Categorical Data Analysis	
STAT 419	Applied Multivariate Statistics	
STAT 530	Statistical Computing with SAS	
STAT 531	Statistical Computing with R	
Total units		45

- ² Students with a B+ or better grade in IME 303 may substitute IME 556 with another approved technical elective course.

- ³ Course cannot be taken by students who have already received credit for IME 410. Another course may substitute, with the approval of the graduate coordinator.

- ⁴ Students may take other 400 or 500 level courses after consultation with and approval by advisor and the graduate coordinator.

¹ Students with a B+ or better grade in IME 326 or IME 327 may substitute IME 503 with another statistics related course such as IME 527, STAT 416, STAT 418, STAT 419, STAT 530, or STAT 531 upon approval of the graduate coordinator.

Materials Engineering

Brown Engineering Bldg. (41), Rm 229
Phone: 805.756.2568; Fax: 805.756.2299
<https://mate.calpoly.edu>
Email: matedept@calpoly.edu

College of Engineering Advising Center
Engineering South (40), Room 114
Phone: 805.756.1461

Department Chair: Trevor Harding

Academic Program

Program name	Program type
Materials Engineering	BS

Materials engineering is a field in which engineers use their knowledge of the relationship between a material's structure and its properties to alter the material to get the performance needed. Materials engineers contribute their expertise in virtually all areas of technology: from the nano-sized materials found in biomedical and microelectronic applications to the large-scale composites found in aerospace applications.

Because engineered products are often limited by materials issues (such as performance and manufacturability), materials engineers play a vital role on engineering design teams, working closely with other engineers. As part of these teams, they apply their knowledge of science, engineering, and state-of-the-art analytical instruments.

The majority of our graduates find employment in the biomedical, electronic, aerospace and petroleum industries. Some work as consultants for large or small organizations. Others become executives. A significant number of materials engineers are involved in research and development. Some of our graduates are entrepreneurs who have started their own consulting or manufacturing companies. Others are attorneys or physicians. Because of our broad-based curriculum, our graduates are able to excel in professions of their choosing.

The curriculum in materials engineering emphasizes practical applications as well as principles. The laboratories are constantly evolving, and our students benefit from frequent exposure to a wide variety of materials testing and analysis equipment. The program is accredited by the Engineering Accreditation Commission ABET, <http://www.ABET.org>. Our students have a reputation for being immediately productive in industry, and they are also actively sought by graduate programs throughout the country.

Vision

To collaboratively overcome the intertwined grand challenges of sustainability and transformative learning through our materials engineering program.

Mission

To be a vibrant, creative and effectual learning community that cultivates the unique capabilities of each individual to thrive in a complex, interconnected and ever-changing world.

Program Education Objectives

1. Holistically address complex challenges, drawing from materials engineering understanding and life experiences;

2. Live meaningful, socially-beneficial lives, enriched by their engineering education;
3. Exemplify proactive adaptive capacity throughout their lives; and
4. Communicate effectively in different contexts

Undergraduate Program BS Materials Engineering

The Materials Engineering curriculum has received national recognition for its innovative structure and will provide both breadth and depth in your understanding of science and engineering principles and practices. The curriculum in materials engineering emphasizes practical applications as well as principles. The laboratories are constantly evolving, and our students benefit from frequent exposure to a wide variety of materials testing and analysis equipment. The program is accredited by the Engineering Accreditation Commission ABET, <http://www.ABET.org>. Our students have a reputation for being immediately productive in industry, and they are also actively sought by graduate programs throughout the country.

BS Materials Engineering Program Learning Outcomes

1. An ability to apply knowledge of mathematics, science, and engineering
2. An ability to design and conduct experiments, as well as to analyze and interpret data
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. An ability to function on multidisciplinary teams
5. An ability to identify, formulate, and solve engineering problems
6. An understanding of professional and ethical responsibility
7. An ability to communicate effectively
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. A recognition of the need for, and an ability to engage in life-long learning
10. A knowledge of contemporary issues
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
12. An ability to apply advanced science (such as Chemistry and Physics) and engineering principles to materials systems
13. An integrated understanding of scientific and engineering principles underlying the four major elements of the field: structure, properties, processing, and performance related to materials systems
14. An ability to apply and integrate knowledge from each of the above four elements of the field to solve materials selection and design problems
15. An ability to utilize experimental, statistical, and computational methods consistent with the goals of the program

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

MATE 110	Introduction to Materials Engineering Design I	1
MATE 120	Introduction to Materials Engineering Design II	1
MATE 130	Introduction to Materials Engineering Design III	1
MATE 210	Materials Engineering	3
MATE 215	Materials Laboratory I	1
MATE 222	Materials Selection Life Cycle	4
MATE 225	Materials Laboratory II	1
MATE 232	Materials, Ethics, and Society	4
MATE 235	Materials Laboratory III	1
MATE 310	Noncrystalline Material Systems	4
MATE 330	Composite Materials Systems	4
MATE 340	Electronic Materials Systems	4
MATE 350	Structural Materials Systems	4
MATE 360	Metallurgical Materials Systems	4
MATE 370	Kinetics of Materials and Process Design	4
MATE 380	Thermodynamics and Physical Chemistry	4
MATE 482	Senior Project I ⁶	1
MATE 483	Senior Project II ⁶	2
MATE 484	Senior Project III ⁶	2
Technical Electives ^{1,2}		
Select from the following:		12
BMED 420	Principles of Biomaterials Design	
BMED 434/ MATE 430	Micro/Nano Fabrication	
BMED/MATE 435	Microfabrication Laboratory	
BMED/MATE 530	Biomaterials	
CHEM 444	Polymers & Coatings I	
CHEM/MATE 446	Surface Chemistry of Materials	
CHEM 447	Polymers and Coatings Laboratory I	
CPE 488/ IME 458/MATE 458	Microelectronics and Electronics Packaging	
EE/PHYS 422	Polymer Electronics Laboratory	
MATE 400	Special Problems for Advanced Undergraduates ⁵	
MATE 401	Materials Characterization Techniques	

MATE 410	Nanoscale Engineering
MATE 425	Corrosion Engineering
MATE 440	Welding Metallurgy and Joining of Advanced Materials
MATE 445	Joining of Advanced Materials Laboratory
MATE 450	Fracture and Failure Analysis
MATE 460	Materials Selection in Mechanical Design
MATE 470	Selected Advanced Topics
MATE 471	Selected Advanced Laboratory
MATE 500	Individual Study ⁵
MATE 510	Materials Analysis
MATE 550	Micro Systems
or BMED 432	Micro/Nano System Design
MATE 522	Advanced Ceramics
MATE 590	Solidification and Densification
PHYS 412	Solid State Physics
PHYS 413	Advanced Topics in Solid State Physics
Approved Electives/Technical Breadth Electives ^{1,2,3}	
Select from the following:	
BIO 231	Human Anatomy and Physiology I
BMED 310	Biomedical Engineering Measurement and Analysis
BMED 401	Biomedical Entrepreneurship
BMED 434/ MATE 430	Micro/Nano Fabrication
BMED/MATE 435	Microfabrication Laboratory
BMED/MATE 530	Biomaterials
BMED 550	Current and Evolving Topics in Biomedical Engineering
BUS 207	Legal Responsibilities of Business
BUS 212	Financial Accounting for Nonbusiness Majors
CE 207	Mechanics of Materials II
CHEM 312	Survey of Organic Chemistry
CHEM 444	Polymers & Coatings I
CHEM/MATE 446	Surface Chemistry of Materials
CHEM 447	Polymers and Coatings Laboratory I
CHEM 466	Learning Assistant Seminar
CPE 488/ IME 458/MATE 458	Microelectronics and Electronics Packaging
CSC 235	Fundamentals of Computer Science for Scientists and Engineers I
EE/PHYS 422	Polymer Electronics Laboratory
ECON 221	Microeconomics
ENGR 322/ SCM 302	The Learn By Doing Lab Teaching Practicum
ENGR 451	Special Topics in Bioengineering
ENGR 470	Selected Advanced Topics
ENGR 471	Selected Advanced Laboratory
IME 223	Process Improvement Fundamentals

IME 303	Project Organization and Management	
IME 421	Manufacturing Organizations	
ITP 341	Packaging Polymers and Processing	
MATE 400	Special Problems for Advanced Undergraduates ⁵	
MATE 401	Materials Characterization Techniques	
MATE 410	Nanoscale Engineering	
MATE 425	Corrosion Engineering	
MATE 440	Welding Metallurgy and Joining of Advanced Materials	
MATE 445	Joining of Advanced Materials Laboratory	
MATE 450	Fracture and Failure Analysis	
MATE 460	Materials Selection in Mechanical Design	
MATE 470	Selected Advanced Topics	
MATE 471	Selected Advanced Laboratory	
MATE 500	Individual Study ⁵	
MATE 510	Materials Analysis	
MATE 522	Advanced Ceramics	
MATE 550	Micro Systems	
or BMED 432	Micro/Nano System Design	
MATE 570	Selected Advanced Topics	
MATE 571	Selected Advanced Laboratory	
MATE 590	Solidification and Densification	
ME 212	Engineering Dynamics	
ME 341	Fluid Mechanics I	
NR 434	Wood Properties, Products and Sustainable Uses	
PHYS 211	Modern Physics I	
PHYS 412	Solid State Physics	
PHYS 413	Advanced Topics in Solid State Physics	
PSC/UNIV 392	Appropriate Technology for the World's People: Design	
PSC/UNIV 492	Appropriate Technology for the World's People: Design	
UNIV 424	Design of Museum Displays of Science, Engineering and Technology	
SUPPORT COURSES		
CE 204	Mechanics of Materials I	3
CHEM 124	General Chemistry for Physical Science and Engineering I (B3/B4) ⁴	4
CHEM 125	General Chemistry for Physical Science and Engineering II	4
CSC 231	Programming for Engineering Students	2
EE 201	Electric Circuit Theory	3
EE 251	Electric Circuits Laboratory	1
ENGL 149	Technical Writing for Engineers (A3) ⁴	4
IME 144	Introduction to Design and Manufacturing	4

IME 314	Engineering Economics ³	3-4
or IME 326	Engineering Test Design and Analysis	
MATH 141	Calculus I (B1) ⁴	4
MATH 142	Calculus II (B1) ⁴	4
MATH 143	Calculus III (Add'l Area B) ⁴	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
ME 211	Engineering Statics	3
Select from the following:		3-4
ME 350	Heat Transfer	
MATE 325 & MATE 326 & MATE 327	Transport Phenomena I and Transport Phenomena II and Transport Phenomena III ³	
PHYS 141	General Physics IA (Add'l Area B) ⁴	4
PHYS 132	General Physics II	4
PHYS 133	General Physics III	4
STAT 312	Statistical Methods for Engineers (B6) ⁴	4
GENERAL EDUCATION		
(See GE program requirements below.)		44
FREE ELECTIVES		
Free Electives		0
Total units		184-186

- ¹ The courses selected to satisfy this requirement may not be used to satisfy other major, support, or general education requirements (no double counting of coursework).
- ² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
- ³ If Support Course requirements are met with IME 314 and with MATE 325, 326, 327 (for a total of six units), at least one unit of upper-division coursework must be taken in Approved Electives/Technical Breadth Electives to meet the minimum requirement of 60 units of upper-division credit.
- ⁴ Required in Support; also satisfies GE.
- ⁵ 8 units maximum of MATE 400 and/or MATE 500 may count towards Technical Electives or Approved Electives/Technical Breadth Electives.
- ⁶ ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for MATE 482, MATE 483 and MATE 484 (5) with the one excess unit counting towards Technical Electives.

General Education (GE) Requirements

- 72 units required, 28 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics	

B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		44

¹ Required in Support; also satisfies GE

Mechanical Engineering

Engineering Bldg. (13), Room 254

Phone: 805.756.1334

<https://me.calpoly.edu>

Department Chair: James Widmann

College of Engineering Advising Center

Engineering South (40), Room 114

Phone: 805.756.1461

Academic Programs

Program name	Program type
Mechanical Engineering	BS, MS

Mission Statement

To impart knowledge in the art and science of mechanical engineering through a comprehensive curriculum true to the traditional Cal Poly learn-by-doing philosophy that produces mechanical engineers of high ethics and skill, fully prepared for entry into industry, government, graduate school and private enterprise.

Program Educational Objectives

A mechanical engineering alumnus will:

1. Research, design, develop, test, evaluate, or implement engineering solutions to problems that are of a complexity encountered in professional practice.
2. Communicate and perform as an effective engineering professional in both individual and team-based project environments.
3. Recognize and determine the ethical implications and societal impacts of engineering solutions.
4. Continuously improve through lifelong learning.

Program Description

The profession of mechanical engineering is directed toward the design, manufacture, and system integration of a very wide variety of equipment ranging from manufacturing machinery and power generation equipment to consumer goods. Of central concern to mechanical engineers is the sound application of basic principles of solid mechanics, fluid mechanics and thermal sciences in the design, manufacture, and application of this equipment. Mechanical Engineering graduates obtain employment primarily with manufacturers, energy companies, consultants, and government agencies. Types of work performed by graduates include product design, mechanical design, testing, engineering management, engineering sales, design of manufacturing systems, and development of maintenance procedures. Mechanical Engineering graduates also often enhance their careers through graduate study in engineering, and some students also study engineering to build a scientific and technical foundation as a prelude to enrollment in medical, law, and business schools.

The focus of the Cal Poly Mechanical Engineering program is on education based on our "learn by doing" educational philosophy. Thus, the curriculum includes a large number of hands-on laboratories, integration of design throughout, and a senior project requirement for all students. Students are enrolled in engineering laboratories in all years of the curriculum. The program is accredited by the Engineering Accreditation Commission of ABET, www.abet.org (<http://www.abet.org>).

The Mechanical Engineering Department is the home of the Donald E. Bently Center for Engineering Innovation. The center provides support for faculty, students, and visiting scholars for the advancement of research, education, and practice in mechanical engineering. A \$6 million endowment to fund three professorships supports the center.

Upper division students in the **General Concentration** (Degree Requirements and Curriculum (p. 254)) can choose professional elective courses from such courses as turbomachinery, robotics, mechatronics, composite materials, rotor dynamics, advanced mechanics, solar systems, internal combustion engines, heat and mass transfer, and courses emphasizing the petroleum, air conditioning, ventilating, and refrigeration industries. Students in the **Mechatronics Concentration** (Degree Requirements and Curriculum (p. 255)) are prepared for professional practice in the design of "intelligent" products for use in factory automation, robotics, hybrid vehicles, alternate energy, and many other fields. The **HVAC&R Concentration** (Degree Requirements and Curriculum (p. 255)) prepares students for careers in the heating, ventilating, air-conditioning and refrigeration (HVAC&R) industry, with a focus on the design of mechanical systems for commercial and industrial buildings. **Manufacturing Concentration** (Degree Requirements and Curriculum (p. 255)) graduates will be uniquely suited for career paths where the engineer blends design and manufacturing. These skills are needed at all modern product development companies.

There are six organized student clubs associated with the Mechanical Engineering Department. These are student chapters of the American Society of Mechanical Engineers, Society of Petroleum Engineers, Society of Automotive Engineers, American Society of Heating, Refrigerating and Air Conditioning Engineers, Alternative Energy Club, and the Pi Tau Sigma honorary society. All of these clubs offer students active programs in professional and leadership activities.

Undergraduate Program BS Mechanical Engineering

The profession of mechanical engineering is directed toward the design, manufacture, and system integration of a very wide variety of equipment ranging from manufacturing machinery and power generation equipment to consumer goods.

Concentrations

- General Concentration
- Heating, Ventilating, Air-Conditioning and Refrigerating Concentration (HVAC&R)
- Mechatronics Concentration
- Manufacturing Concentration

Graduate Program MS Mechanical Engineering

The masters program of the Mechanical Engineering department at Cal Poly is designed to prepare its graduates with skill and knowledge to be able to work as an engineer in research and development, analysis, or design of products and systems, or to continue toward a PhD degree from other institutions. Due to the nature of the masters degree, students can select an area of emphasis based on their interest, or alternately, choose courses in a variety of different areas that gives them significant breadth of knowledge. At Cal Poly, masters degree candidates can select a thesis option or a non-thesis option. The thesis option gives the candidates a more thorough knowledge in the area in which they do their

research. The non-thesis option gives the candidates a more diverse knowledge from additional courses.

General Characteristics

The Master of Science in Mechanical Engineering prepares students to design and develop advanced products and systems; to conduct research and analysis; to work in industry; or to continue study toward a Ph.D. Graduate students enjoy the same flavor of learn-by-doing as other Cal Poly students. Students may choose their technical electives in the area that interests them, including thermo-sciences, controls and robotics, mechanics and stress analysis, composite materials.

Prerequisites

For admission as a classified graduate student, in addition to the University requirements, an applicant should hold a BS degree in Mechanical Engineering with a grade point average of 3.0 or better. Other closely related majors may be accepted as conditionally classified graduate students if they have had an adequate number of prerequisite classes to successfully fulfill the requirements. Up to 12 units of remedial courses may be taken at Cal poly. For additional information on University requirements, please refer to the Graduate Programs (p. 408) of this catalog.

Two program options are available:

Thesis option. 36 units of advisor-approved coursework, 9 units of thesis research/design, and an oral thesis defense examination.

Non-thesis option. 45 units of advisor-approved coursework and a written comprehensive examination.

Blended BS + MS Mechanical Engineering

The blended program provides motivated students with an accelerated route to the MS Mechanical Engineering, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status. Up to two technical electives can be taken as an undergraduate and counted towards the master's degree.

Eligibility

Students majoring in BS Mechanical Engineering may be eligible to pursue the blended program toward the MS Mechanical Engineering (p. 256). Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 2.5 required, 3.0 recommended. Students are recommended for admission by a faculty committee. Please see Graduate Education (<https://nextcatalog-admin.calpoly.edu/graduateeducation/#generalpoliciesgoverninggraduatestudiestext>) for eligibility criteria.

Two program options are available: **Thesis option.** 36 units of advisor-approved coursework, 9 units of thesis research/design, and an oral thesis defense examination. **Non-thesis option.** 45 units of advisor-approved coursework and a written comprehensive examination.

BS Mechanical Engineering Program Learning Outcomes

The general program outcomes listed below are from our accrediting body, ABET, <http://www.ABET.org>. The 3 or 4 skills listed under each

outcome were defined by the faculty in the ME program. Students who demonstrate proficiency in these skills satisfy the program outcomes.

1. An ability to apply knowledge of mathematics, science, and engineering
 - a. The student will be able to evaluate basic geometrical quantities and mathematical expressions.
 - b. The student will have knowledge of basic sciences and associated analysis techniques.
 - c. The student will be proficient with basic analyses associated with other disciplines.
2. An ability to design and conduct experiments, as well as to analyze and interpret data
 - a. The student will be proficient with the selection and basic operation of common instrumentation used in engineering measurement.
 - b. The student will be able to design and conduct an experiment and compare the results to those predicted by an analytical model.
 - c. The student will be able to interpret and discuss the results.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
 - a. The student will be able to recognize a need and develop appropriate design specifications.
 - b. The student will be able to develop component, system, or process concept solutions based on above specifications.
 - c. The student will be able to use analysis to refine the design of a component, a system, or a process.
 - d. The student will be able to build a functional prototype and assess if it meets performance specifications.
4. An ability to function on multidisciplinary teams
 - a. The student will recognize the value of a broad skill set resulting from a multidisciplinary team.
 - b. The student will be able to communicate effectively with colleagues in other disciplines.
 - c. The student will be able to identify when problems occur due to poor interactions among team members and identify ways to improve team dynamics.
5. An ability to identify, formulate, and solve engineering problems
 - a. The student will be able to identify faulty products or processes and develop an engineering solution.
 - b. The student will be able to select appropriate models for analyzing a system.
 - c. The student will be able to analyze their models and interpret their results.
6. An understanding of professional and ethical responsibility
 - a. The student will have knowledge of ASME code of ethics.
 - b. The student will be able to identify health and safety concerns associated with their design.
 - c. The student will be able to identify situations with ethical concerns.
7. An ability to communicate effectively
 - a. The student will be able to write an effective memorandum, letter, abstract, and project report.

- b. The student will be able to give a coherent and effective oral presentation.
 - c. The student will be able to critique writing samples and oral presentations and identify both strong points and weak points in grammar, clarity, and organization.
8. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
 - a. The student will be aware of society's need for engineering solutions.
 - b. The student will be aware of the environmental and economic impact of their engineering solutions.
 - c. The student will be able to identify possible unintended negative global or societal consequences of proposed engineering solutions.
9. A recognition of the need for, and an ability to engage in life-long learning
 - a. The student will be able to understand the limitations of their knowledge.
 - b. The student will be able to find and use appropriate technical resources.
 - c. The student will be able to identify their need for additional education.
10. A knowledge of contemporary issues
 - a. The student will be able to identify important contemporary regional, national, or global issues.
 - b. The student will be able to discuss the historical roots of important contemporary regional, national, or local issues.
 - c. The student will be able to discuss ways engineers are contributing or might contribute to the solution of regional, national, or global problems.
11. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
 - a. The student will be proficient with computer-based design simulation and analysis tools.
 - b. The student will be able to perform parametric studies of proposed designs.
 - c. The student will be able to develop a computer algorithm to solve a numerical problem.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

ME 128	Introduction to Mechanical Engineering I ¹	1
--------	---	---

ME 129	Introduction to Mechanical Engineering II ¹	1
ME 130	Introduction to Mechanical Engineering III ¹	1
ME 163	Freshmen Orientation to Mechanical Engineering ¹	1
ME 211	Engineering Statics	3
ME 212	Engineering Dynamics	3
ME 234	Philosophy of Design	3
ME 236	Measurement and Engineering Data Analysis	3
ME 251	Introduction to Detailed Design with Solid Modeling	2
ME 302	Thermodynamics I	3
ME 303	Thermodynamics II	3
ME 318	Mechanical Vibrations	4
ME 326	Intermediate Dynamics	4
ME 328	Design for Strength and Stiffness	4
ME 329	Mechanical Systems Design	4
ME 341	Fluid Mechanics I	3
ME 347	Fluid Mechanics II	4
ME 350	Heat Transfer	4
ME 420	Thermal System Design	4
ME 422	Mechanical Control Systems	4
Concentration		21-23

SUPPORT COURSES

BIO 213 & BMED 213	Life Science for Engineers and Bioengineering Fundamentals (B2) ²	4
CE 204	Mechanics of Materials I	3
CE 207	Mechanics of Materials II	2
CHEM 124	General Chemistry for Physical Science and Engineering I (B3/B4) ²	4
CHEM 125	General Chemistry for Physical Science and Engineering II	4
CSC 231	Programming for Engineering Students	2-3
or CSC 234	C and Unix	
EE 201	Electric Circuit Theory	3
EE 251	Electric Circuits Laboratory	1
EE 321	Electronics	3
EE 361	Electronics Laboratory	1
ENGL 149	Technical Writing for Engineers (A3) ²	4
IME 142	Manufacturing Processes: Materials Joining	2
IME 143	Manufacturing Processes: Material Removal	2
MATE 210 & MATE 215	Materials Engineering and Materials Laboratory I	4
MATH 141	Calculus I (B1) ²	4
MATH 142	Calculus II (B1) ²	4
MATH 143	Calculus III (Add'l Area B) ²	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4

MATH 344	Linear Analysis II (B6) ²	4
PHYS 131 or PHYS 141	General Physics I (Add'l Area B) ² General Physics IA	4
PHYS 132	General Physics II	4
PHYS 133	General Physics III	4
Manufacturing Processes Elective		
Select from the following:		1-4
IME 141	Manufacturing Processes: Net Shape	
ITP 341	Packaging Polymers and Processing	
GENERAL EDUCATION		
(See GE program requirements below.)		40
FREE ELECTIVES		
Free Electives		0
Total units		196-202

¹ ME 228 and ME 229 are required in lieu of ME 128, ME 129, ME 130, and ME 163 for transfer students.

² Required in Support; also satisfies GE.

Concentrations (select one)

- General (p. 254)
- Heating, Ventilating, Air-Conditioning and Refrigerating (HVAC&R) (p. 255)
- Mechatronics (p. 255)
- Manufacturing (p. 255)

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 8 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Support) ¹	0
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
B6	Upper-division Area B (4 units in Support) ¹	0
Additional Area B units (8 units in Support) ¹		0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	

D1	The American Experience (Title 5, Section 40404 requirement) (40404)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
Total units		40

¹ Required in Support; also satisfies GE

Mechanical Engineering - General Concentration

EE 255	Energy Conversion Electromagnetics	3
EE 295	Energy Conversion Electromagnetics Laboratory	1
ME 428	Senior Design Project I ⁴	2
ME 429	Senior Design Project II ⁴	2
ME 430	Senior Design Project III ⁴	2
Technical Electives ^{1,2,3}		
Select from the following:		11-12
Select at least 8 units from the following ME courses:		
ME 305	Introduction to Mechatronics	
ME 359	Fundamentals of HVAC Systems	
ME 401	Stress Analysis	
ME 402	Orthopedic Biomechanics	
ME/CE 404	Applied Finite Element Analysis	
ME 405	Mechatronics	
ME 410	Experimental Methods in Mechanical Design I	
ME 412	Composite Materials Analysis and Design	
ME 415	Energy Conversion	
ME 416	Ground Vehicle Dynamics and Design	
ME 423	Robotics: Fundamentals and Applications	
ME 431	Mechanical Design Techniques	
ME 434	Enhanced Oil Recovery	
ME 435	Drilling Engineering	
ME 436	Petroleum Production Engineering	
ME 441	Single Track Vehicle Design	
ME 442	Design of Machinery	
ME 443	Turbomachinery	
ME 444	Combustion Engine Design	
ME 450	Solar Thermal Power Systems	
ME 456	HVAC Air and Water Distribution System Design	
ME 457	Refrigeration Principles and Design	
ME 458	Building Heating and Cooling Loads	
ME 488	Wind Energy Engineering	
ME 501/CE 511	Continuum Mechanics and Elasticity	
ME 503/CE 513	Inelastic Stress Analysis	
ME/CE 504	Finite Element Analysis	
ME 506	System Dynamics	

ME 507	Mechanical Control System Design	
ME 517	Advanced Vibrations	
ME 518	Machinery Vibration and Rotor Dynamics	
ME 540	Viscous Flow	
ME 541	Advanced Thermodynamics	
ME 542	Dynamics and Thermodynamics of Compressible Flow	
ME 552	Advanced Heat Transfer I	
ME 553	Advanced Heat Transfer II	
ME 554	Computational Heat Transfer	
ME 556	Advanced Heat Transfer III	
ME 579	Fluid Power Control	
Select 3 to 4 units of non-ME courses from:		
Any upper division or graduate level course in the College of Engineering with the exception of GE Area F, ENGR 301, senior project, thesis, special problems, and coop courses.		

Total units 21-22

- ¹ Consultation with advisor is recommended prior to selecting technical electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
- ² ME 470, ME 471, ME 570 and ME 571 are variable topics courses and may or may not count as ME electives. Please contact instructor for additional information. A course substitution form is required. Note, substitutions have been approved for the following topics:
- ME 470: Introduction to Building Energy Modeling; Pressure Water Nuclear Reactor; Advanced Topics in HVAC&R; and Rehabilitation Engineering
 - ME 471: Introduction to Building Energy Modeling; Rehabilitation Engineering Lab
- ³ ME 400 and ME 500 are independent study classes and may be acceptable for technical elective credit. A course substitution form is required.
- ⁴ ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for ME 428, ME 429 and ME 430 (6).

Heating, Ventilating, Air-Conditioning and Refrigerating Concentration (HVAC&R)

ME 359	Fundamentals of HVAC Systems	4
ME 456	HVAC Air and Water Distribution System Design	4
ME 457	Refrigeration Principles and Design	4
ME 458	Building Heating and Cooling Loads	4
ME 459	HVAC Senior Design Project I	3
ME 460	HVAC Senior Design Project II	2
Total units		21

Mechatronics Concentration

ME 305	Introduction to Mechatronics	4
ME 405	Mechatronics	4

ME 423	Robotics: Fundamentals and Applications	4
or ME 506	System Dynamics	
or ME 507	Mechanical Control System Design	
ME 428	Senior Design Project I ²	2
ME 429	Senior Design Project II ²	2
ME 430	Senior Design Project III ²	2
Select from the following: ¹		3-4
IME 356	Manufacturing Automation	
IME 416	Automation of Industrial Systems	
ME 506	System Dynamics	
ME 507	Mechanical Control System Design	
Total units		21-22

¹ Elective based on interests of students.

² ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for ME 428, ME 429 and ME 430 (6).

Manufacturing Concentration

IME 327	Test Design and Analysis in Manufacturing Engineering	4
Choose one of the following emphasis areas:		8

Mechanical Manufacturing

IME 330	Fundamentals of Manufacturing Engineering	
IME 450	Manufacturing Process and Tool Engineering	

Electronics Manufacturing

IME/MATE 458	Microelectronics and Electronics Packaging	
MATE 430 & MATE 435	Micro/Nano Fabrication and Microfabrication Laboratory	

Design and Manufacturing Elective

Select from the following:		3-5
IME 330	Fundamentals of Manufacturing Engineering ¹	
IME 335	Computer-Aided Manufacturing I	
IME 356	Manufacturing Automation	
IME 416	Automation of Industrial Systems	
IME 418	Product-Process Design	
IME 428	Engineering Metrology	
IME 430	Quality Engineering	
IME 457	Advanced Electronic Manufacturing	
IME/MATE 458	Microelectronics and Electronics Packaging ¹	
IME 527	Design of Experiments	
IME 543	Applied Human Factors	
MATE 430 & MATE 435	Micro/Nano Fabrication and Microfabrication Laboratory ¹	
MATE 440 & MATE 445	Welding Metallurgy and Joining of Advanced Materials and Joining of Advanced Materials Laboratory	
ME 305	Introduction to Mechatronics	

ME 412	Composite Materials Analysis and Design	
ME 428 & ME 429 & ME 430	Senior Design Project I and Senior Design Project II and Senior Design Project III ²	6
Total units		21-23

¹ If not taken as part of the emphasis area. Courses cannot be double counted.

² ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for ME 428, ME 429 and ME 430 (6).

MS Mechanical Engineering

Program Learning Outcomes

Upon completing the requirements of the Master of Science in Mechanical Engineering, students should be able to:

1. Devise a plan to research issues relevant to the problem at hand and to conduct experiments or develop a computer model.
2. Formulate solutions to advanced engineering problems.
3. Analyze the collected or generated data and draw conclusions from the results.
4. Analyze and synthesize advanced engineering solutions.

Required Courses

ME 599	Design Project (Thesis)	9
Or 9 units of approved Technical Electives and a Comprehensive Examination		
Approved MATH/STAT/CSC Courses		8
Select from the following:		12
ME 501	Continuum Mechanics and Elasticity	
ME 503	Inelastic Stress Analysis	
ME 504	Finite Element Analysis	
ME 506	System Dynamics	
ME 507	Mechanical Control System Design	
ME 517	Advanced Vibrations	
ME 518	Machinery Vibration and Rotor Dynamics	
ME 540	Viscous Flow	
ME 541	Advanced Thermodynamics	
ME 542	Dynamics and Thermodynamics of Compressible Flow	
ME 552	Advanced Heat Transfer I	
ME 553	Advanced Heat Transfer II	
ME 554	Computational Heat Transfer	
ME 556	Advanced Heat Transfer III	
ME 579	Fluid Power Control	

Approved Technical Electives

400 or 500-level ME or non-ME courses; maximum of 12 units of 400-level courses allowed	16
Total units	45

College of Liberal Arts

Faculty Office Bldg. (47), Room 31

Phone: 805.756.2359

<https://cla.calpoly.edu>

Interim Dean: Kathryn Rummell

Associate Dean: Penny K. Bennett

Associate Dean: Jennifer Teramoto Pedrotti

Associate Dean: Debra L. Valencia-Laver

Academic Programs

Program name	Program type
Agricultural Communication	Minor
Anthropology and Geography	BS, Minor
Art and Design	BFA
Art History	Minor
Asian Studies	Minor
Child Development	BS, Minor
Communication Studies	BA, Minor
Comparative Ethnic Studies	BA
Computing for Interactive Arts	Minor
Dance	Minor
English	BA, MA, Minor
Ethnic Studies	Minor
Ethics, Public Policy, Science and Technology	Minor
French	Minor
Gender, Race, Culture, Science and Technology	Minor
German	Minor
Gerontology	Minor
Global Politics	Minor
Graphic Communication	BS, Minor
History	BA, MA, Minor
Indigenous Studies in Natural Resources and the Environment	Minor
Integrated Marketing Communications	Minor
Interdisciplinary Studies	BA
Italian Studies	Minor
Journalism	BS
Latin American Studies	Minor
Law and Society	Minor
Liberal Arts & Engineering Studies	BA
Linguistics	Minor
Media Arts, Society and Technology	Minor
Modern Languages and Literatures	BA
Music	BA, Minor
Philosophy	BA, Minor
Photography	Minor
Political Science	BA, Minor
Printed Electronics and Functional Imaging	MS
Psychology	BS, MS, Minor
Public Policy	MPP
Queer Studies	Minor

Religious Studies	Minor
Science and Risk Communication	Minor
Sociology	BA, Minor
Spanish	Minor
Studio Art	Minor
Theatre Arts	BA, Minor
Western Intellectual Tradition	Minor
Women's and Gender Studies	Minor

The College of Liberal Arts (CLA) provides students the opportunity to study the record of imaginative and reflective human experience and to add to that record via a variety of Learn by Doing activities that emphasize active learning inside and outside of the classroom. Home to the foundational disciplines that form the scholarly bases for cultural awareness, knowledge and skills, diversity and inclusion are central to the college's curriculum and identity. The college also seeks to relate itself to the technological disciplines in ways that help contribute to the solution of human problems from global and multidisciplinary perspectives. Accordingly, a wide range of courses is offered to serve every student without regard to specialized professional interests.

Four broad areas of knowledge are represented: the fine and performing arts, communications, humanities, and social sciences. While the college has great breadth and diversity, unity is found in a study of the most engaging subject of all – human endeavor. Whatever the focus, the programs in the CLA share a settled purpose: to help students know themselves, understand human values and human potential within a cultural context, and understand our society and its institutions.

The CLA offers a wide selection of classes that fulfill Cal Poly's general education and USCP requirements. Foundational courses provide students with a strong grounding in critical thinking and written and oral communication. The disciplines of the liberal arts are explored at both introductory and advanced levels; students are encouraged to further pursue areas of interest through the college's many minors.

The college also offers interdisciplinary courses through its Interdisciplinary Studies in the Liberal Arts (ISLA) Program, including in its four interdisciplinary minors that explore the intersection of science, technology and society. For more information, contact the ISLA Program Office (Bldg 47, 25H; 805.756.1525).

The college's interdisciplinary major, Bachelor of Arts in Liberal Arts and Engineering Studies, allows students to combine coursework from the College of Liberal Arts and the College of Engineering to explore cutting-edge technologies and their applications to areas such as media arts, technology policy, and technical writing and communications. The degree is offered jointly by both colleges. For more information, see Interdisciplinary Degree Programs (p. 398).

International issues are well represented in the college curriculum, and study abroad opportunities are also strongly supported. CLA faculty regularly offer classes in programs such as Cal Poly's Summer Study in London, Thailand Study Program, Valladolid (Spain) Program, and Australia Abroad Program. The college is also involved with the Peru Summer Study Program, which provides internships that complement the minor in Latin American Studies. These and other study abroad programs are administered by the Cal Poly International Center. For further information, see Cal Poly International Center (<http://international.calpoly.edu>).

The College of Liberal Arts offers a wide range of learn-by-doing opportunities. Students from all majors can participate in the musical ensembles, theater productions, and dance performances. The college supports the Central Coast Center for Arts Education and the University Art Gallery. Students, especially those in the social and behavioral sciences, participate in a variety of internships at the local, state, and national government level, and with community, social services, and educational organizations, serving a number of populations. Students contribute to publications that showcase their accomplishments in the disciplines, such as *Byzantium* (English), *The Forum* (History), *Paideia* (Political Science), and *Sprinkle* (Women's and Gender Studies). These publications are often printed by the student-run University Graphic Systems. Students also participate in the student-produced award-winning Mustang Media, KCPR Radio, and CPTV.

The college has a major responsibility for activities that promote inclusion and enhance the cultural and intellectual life of the University and the community. Departments regularly host speakers and present films and other programming. The college sponsors the Spanos Theatre and Cal Poly Arts, offering a full range of cultural programs, including exhibits, concerts, literary presentations, and dramatic and other productions, while fostering artistic development and accomplishment across the campus.

College of Liberal Arts graduates will be able to:

- 1. Question assumptions through critical inquiry.
- 2. Be innovative; think creatively and constructively.
- 3. Communicate effectively orally and in writing.
- 4. Develop scholarly depth within their disciplines.
- 5. Understand the value of cross-disciplinary knowledge.
- 6. Collaborate productively in diverse settings and with diverse others.
- 7. Make reasoned, ethical, and socially and ecologically responsible decisions.
- 8. Understand the self as product of - and participant in - global traditions of art, ideas, and values.
- 9. Engage in life-long learning.

Interdisciplinary Minors

Agricultural Communication Minor

An interdisciplinary minor sponsored by the College of Agriculture, Food and Environmental Sciences and the College of Liberal Arts. For more information, see the College of Agriculture, Food and Environmental Sciences (p. 66) section.

Computing for Interactive Arts Minor

An interdisciplinary minor sponsored by the Art and Design department and the Computer Science department. For more information, see the Computer Science and Software Engineering (p. 219) section.

Indigenous Studies in Natural Resources and the Environment Minor

An interdisciplinary minor sponsored by the departments of Natural Resources Management and Environmental Sciences and Ethnic Studies. For more information, see the Natural Resources Management and Environmental Sciences (p. 127) section.

Integrated Marketing Communications Minor

An interdisciplinary minor sponsored by the Orfalea College of Business and the College of Liberal Arts. For more information, see the Orfalea College of Business (p. 173) section.

Western Intellectual Tradition Minor

Faculty Offices North (Bldg. 47), Room 37B
Phone: 805.756.1397

Professor and Director: D. Kenneth Brown

This minor is designed to appeal not only to majors in the College of Liberal Arts and the College of Science and Mathematics, but to a cross-section of students in major programs throughout the university community. It focuses on the accomplishments of the Western intellectual tradition through courses that trace the development of literary expression, philosophical and scientific thought, and historical understanding from their beginnings to the modern world. Courses in the minor provide direct experience with significant works of the Western tradition, and also expose students to crucial ideas and themes that shaped Western thought and culture. Such exposure cultivates the intellectual skills of analysis and creative expression, and promotes an understanding of the inherent intellectual debate and diversity within the Western intellectual tradition.

Western Intellectual Tradition Minor

A maximum of 4 units from Group A and 4 units from Group B may be major or support courses in a student's degree program.

Group A

Select 12 units from at least two (2) of the following groupings:		12
Great Books — Literature (C1): ¹		
ENGL 251	Great Books I: Introduction to Classical Literature	
ENGL 252	Great Books II: Medieval to Enlightenment Literature	
ENGL 253	Great Books III: Romanticism to Modernism Literature	
Great Books — Philosophy (C2): ¹		
PHIL 230	Philosophical Classics: Knowledge and Reality	
PHIL 231	Philosophical Classics: Ethics and Political Philosophy	
Science and Mathematics ¹		
MATH 112	Nature of Modern Math (B1) ¹	
PHYS 104	Introductory Physics (B3) ¹	
PHYS 111	Contemporary Physics for Nonscientists (B3) ¹	
PHYS 121	College Physics I (B3) ¹	
PHYS 131	General Physics I (B3 & B4) ¹	
PHYS 141	General Physics IA (B3) ¹	
Political Science:		
POLS 230	Basic Concepts of Political Thought	
Western Civilization:		

HIST 110	Western Civilization: Ancient to Renaissance
HIST 111	Western Civilization: Reformation to the Present

Group B

Select 16 units from at least three (3) of the following groupings: 16

British and American Literature: ¹	
ENGL 330	British Literature in the Age of Belief: to 1485 (C4 GWR) ¹
ENGL 331	British Literature in the Age of Discovery: 1485-1660 (C4 GWR) ¹
ENGL 332	British Literature in the Age of Enlightenment: 1660-1798 (C4 GWR) ¹
ENGL 333	British Literature in the Age of Romanticism: 1798-1832 (C4 GWR) ¹
ENGL 334	British Literature in the Age of Industrialism: 1832-1914 (C4 GWR) ¹
ENGL 339	Introduction to Shakespeare (C4 GWR) ¹
ENGL 340	The Literary Sources of the American Character: 1600-1865 (C4 GWR) ¹
ENGL 341	The Literary Sources of the American Character: 1865-1914 (C4 GWR) ¹
ENGL 354	The Bible as Literature and in Literature and the Arts (C4 GWR) ¹
ENGL 430	Chaucer
ENGL 431	Shakespeare
ENGL 432	Milton
History:	
HIST 306	The Witch-Hunts in Europe, 1400-1800 (D5) ¹
HIST 307	European Thought 1800-2000 (D5) ¹
HIST 334	Modern Europe, 1789-1914 (D5) ¹
HIST 350	The Scientific Revolution, c. 1500-1800 (D5) ¹
HIST 452	Renaissance and Reformation Europe
HIST 453	Religious Wars and Absolutism
Language and Literature:	
FR 305	Significant Works in French (C4) ¹
GER 305	Significant Works in German (C4) ¹
SPAN 305	Significant Works in Spanish (C4) ¹
SPAN 416	Don Quixote
Philosophy:	
PHIL 309	Early Greek Philosophy through Plato (C4) ¹
PHIL 310	Aristotle and Hellenistic Philosophy (C4) ¹
PHIL 312	Medieval Philosophy (C4) ¹
PHIL 313	Early Modern Rationalism (C4) ¹
PHIL 314	Early Modern Empiricism (C4) ¹
PHIL 315	Kant and 19th Century European Philosophy (C4) ¹

PHIL 332	History of Ethics (C4) ¹
PHIL 429	Special Topics in the History of Philosophy
Political Thought:	
POLS 329	Ancient and Medieval Political Thought
POLS 330	Modern Political Thought
POLS 348	Early American Political Thought (D5) ¹
POLS 349	Contemporary American Political Thought (D5) ¹
Rhetoric:	
COMS 330	Classical Rhetorical Theory
COMS 331	Contemporary Rhetorical Theory
COMS 435	American Political Rhetoric
Science and Mathematics:	
BIO 414	Evolution
MATH 419	Introduction to the History of Mathematics
PHIL 421	Philosophy of Space, Time and Matter
PHYS 302	Classical Mechanics I

Total units	28
-------------	----

¹ Satisfies General Education requirement units.

Art & Design

Dexter Bldg. (34), Room 169
Phone: 805.756.1148
<https://artdesign.calpoly.edu>

Department Chair: Giancarlo Fiorenza

Academic Programs

Program name	Program type
Art and Design	BFA
Art History	Minor
Photography	Minor
Studio Art	Minor

Admission/acceptance to the Bachelor of Fine Arts degree program in Art and Design requires a demonstrated ability in the chosen concentration in art through the presentation of a representative portfolio, outlined in the department’s submission guidelines. Submission of portfolio is by invitation only; the department will contact students with information regarding submitting the appropriate materials in a timely manner.

The department operates the University Art Gallery, located in the Dexter Building (34), room 171. The gallery is a venue that serves the University, the city of San Luis Obispo, and the surrounding areas. It showcases nationally and internationally known artists, as well as student, alumni and faculty artwork. The gallery creates an environment for learning and discussion of ideas critical to art and society.

Undergraduate Programs

BFA Art and Design

The Bachelor of Fine Arts degree (BFA) program in Art and Design offers a major with concentrations in graphic design, photography & video, and studio art. The BFA in Art and Design is accredited by the National Association of Schools of Art and Design. The department has made a commitment to cultural diversity. Wherever possible, this commitment is evidenced by the inclusion of material which identifies significant multicultural influences on the content of the courses in our curriculum. Courses are available for all students to enrich their creativity, understanding, appreciation, and practical skills in art.

Concentrations

All three concentrations support creative and aesthetic growth and require the development of technical skills as a foundation for personal direction and enrichment. Through team projects, students have the unique opportunity to experience the interaction and relationship of graphic design, photography, and studio art.

Graphic Design¹

The study of graphic design, typography, interaction design, design history and design theory. Emphasis is placed on concept development, design thinking, and creative problem solving. The program culminates in the development of a portfolio that demonstrates the breadth of skills needed to enter the professional design industry. Graduates of the program obtain positions in graphic design studios, corporate creative departments, advertising agencies, tech companies, and related industries.¹

¹ The Art and Design Department’s Graphic Design concentration focuses on creative problem-solving and development of design and layout skills. The Graphic Design concentration leads to positions such as graphic designer, web designer, art director and creative director for advertising agencies, design studios and corporate design departments. In contrast, the Graphic Communication Department’s (GrC) Design Reproduction Technology concentration focuses on the technical and digital aspects of transforming design solutions for output and reproduction in print and digital form. The concentration focuses on printing, web development, publishing, digital imaging, and related areas of media preparation and production.

Photography and Video

The study and practice of the lens-based arts of photography and video. Emphasis is placed on concept development, photographic seeing, and creative problem solving. Production skills with studio and location lighting are emphasized using digital image making, large format photography and video/cinematic production. This is a diversified, commercially oriented program stressing preparation for careers in advertising, illustration, video and cinema production, corporate and editorial photography, portraiture and digital image making for both online and print. The study of photographic history, cinema styles and contemporary practices is integral to the program. The program culminates in the creation of a professional portfolio in both still and motion that can allow the graduate to enter the professional workforce or apply for graduate study.

Studio Art

A selective program designed for students seeking a broad based undergraduate education in the visual arts. The program is distinctive for its depth of required coursework in both two- and three-dimensional media. The upper division curriculum allows students to specialize in preparation for pursuit of advanced degrees and/or careers in the visual arts. With its learn-by-doing philosophy and its commitment to both the liberal arts and technology, Cal Poly provides a unique setting for studying the visual arts. Within this context, students in the Studio Art concentration are presented with an environment where imagination, intellectual rigor, self expression and skill development are expected and valued.

Art History Minor

Courses consist of a required core and approved electives. The courses include art and architectural history. Students, working with an advisor, select their area(s) of interest.

Advisor: Elizabeth Adan or Giancarlo Fiorenza

Photography Minor

Courses consist of a required core and approved electives. Students, working with an advisor, select their area(s) of interest. Admission to the minor is contingent upon a departmental review of a portfolio as specified on the minor curriculum sheet.

Advisor: Sky Bergman or Lana Caplan

Studio Art Minor

Courses consist of a required core and approved electives that focus on 2D and 3D studio art. Students select their area(s) of interest after consultation with an advisor.

Advisor: Sara Frantz, Tera Galanti or Elizabeth Folk

BFA Art and Design

Program Learning Objectives

1. Produce a strong body of work and/or professional portfolio
2. Establish and maintain a rigorous creative practice that is productive and professional
3. Utilize an articulate, sophisticated visual, verbal, and technical vocabulary related to art and design from a broad range of styles and periods
4. Apply comparative reasoning in evaluating works of art and design
5. Contribute to diverse, cross-disciplinary, collaborative endeavors
6. Resolve problems and challenge assumptions through innovative thinking and visual expression
7. Demonstrate integrity and make ethical decisions in creative expression and professional practice
8. Perpetuate a life-long commitment to learning, inquiry, and discovery

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: Up to 4 units of credit/no credit grading may be selected for courses in major or concentration.

MAJOR COURSES

ART 101	The Fundamentals of Drawing (C3) ¹	4
ART 102	Art and Design Foundation Studies I	4
ART 103	Art and Design Foundation Studies II	4
ART 104	Art and Design Foundation Studies III	4
ART 182	Foundation in Digital Art I	4
ART 203	Art Theory and Practice	4
ART 209	Beginning Painting	4
ART 212	Art History - Renaissance through Baroque Eras	4
ART 213	Art History- Modern Art, 1900-1945	4
ART 224	Introduction to Artificial Lighting for Photography	4
ART 260	Critique, Discourse and Practice	4
ART 315	Art History - Art Since 1945	4
Art History Electives		8

Select from the following upper division art history courses not already required in major core or concentration:

ART 310	Art History - American Art	
---------	----------------------------	--

ART 311	Art History - Nineteenth Century Art	
ART 313	Design History	
ART 314	History of Photography	
ART/WGS 316	Women as Subject and Object in Art History	
ART 317	Asian Art Survey	
ART 318	Asian Art Topics: National, Religious, and Intellectual Movements	
ART 370	Michelangelo	
ART 371	Topics in Renaissance Art	
ART 373	New Media Art History	
Upper Division Art Elective		
Select any upper division ART course not already used to meet Major or Concentration requirements. See course descriptions for repeatable units.		4
ART 463	Senior Portfolio Project	4
Concentration courses (see below)		52
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		64-68
FREE ELECTIVES		
Free Electives ²		0-4
Total units		184

¹ Required in Major; also satisfies GE.

² If GE courses are used to satisfy Concentration requirements, additional units of Free Electives may be required to complete the 184 total unit requirement.

Concentrations (select one)

- Graphic Design (p. 262)
- Photography (p. 262) and Video (p. 262)
- Studio Art (p. 262)

General Education (GE) Requirements

- 72 units required, 4 of which are specified in Major and/or Support.
- See the complete GE course listing.
- Minimum of 12 units required at the 300 level.

Area A Communication

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation and Writing	4

Area B Science and Mathematics

B1 Mathematics/Statistics	8
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3 course	
B5 Area B elective (select one course from B1-B5)	4

Area C Arts and Humanities

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts (4 units in major) ¹	0
C4 Upper-division elective (no ART course) (may be in Concentration) ²	0-4

Area D/E Society and the Individual		
D1 The American Experience (Title 5, Section 40404 requirement)	4	
D2 Political Economy	4	
D3 Comparative Social Institutions	4	
D4 Self Development (CSU Area E)	4	
D5 Upper-division elective	4	
Area F Technology		
F Upper-division elective	4	
Total units	64-68	

¹ Required in Major; also satisfies GE.

² Required in Photography and Video Concentration; also satisfies GE.

Graphic Design Concentration

ART 183	Foundation in Digital Art II	4
ART 201	Intermediate Drawing	4
ART 237	Graphic Design I	4
ART 238	Typography I	4
ART 288	Interaction Design I	4
ART 313	Design History	4
ART 337	Graphic Design II	4
ART 338	Typography II	4
ART 388	Interaction Design II	4
ART 437	Graphic Design III	4
ART 438	Typography III	4

Concentration Electives

Select from the following:		8
ART 330	Book Arts	
ART 334	Illustration I: Techniques and Tools	
ART 350	Computing for Interactive Arts Capstone I	
ART 353	Intermedia / Art	
ART 383	Digital Video I	
ART 400	Special Problems for Advanced Undergraduates	
ART 432	Advertising Design	
ART 434	Illustration II	
ART 439	Type in Motion	
ART 450	Computing for Interactive Arts Capstone II	
ART 484	Animation, Video, and Interactive Design	
ART 488	Interaction Design III	
ART 489	Advanced Interactive Media Art	
ART 494	Cooperative Education Experience	
ART 495	Cooperative Education Experience	
Total units		52

Photography and Video Concentration

ART 122	Basic Digital Photography	4
---------	---------------------------	---

ART 222	Black and White Photography	4
ART 314	History of Photography	4
ART 324	Photographic Expression	4
ART 325	Advanced Camera and Lighting Techniques	4
ART 329	Editorial Photography	4
ART 383	Digital Video I	4
ART 427	Advertising Photography	4
ART 483	Digital Video II	4

Select one from the following:		4
ENGL 371	Film Styles and Genres (C4) ¹	
ENGL 372	Film Directors (C4) ¹	
ENGL 387	Fiction Writing (C4) ¹	
GRC 331	Color Management and Quality Analysis	4

Concentration Electives

Select from the following:		8
Any 300-400 level ART courses not already used to meet major or concentration requirements, OR		
ISLA 340 & ISLA 341	Media Arts and Technologies: Storytelling and Media Arts and Technologies: Cinematic Process (4,4)	

Total units	52
-------------	----

¹ Required in Concentration; also satisfies GE. Up to 4 additional units of Free Electives may be required to complete the 184 total unit requirement.

Studio Art Concentration

ART 148	Beginning Sculpture	4
ART 201	Intermediate Drawing	4
ART 302	Figure Drawing	4
ART 309	Intermediate Painting	4
ART 348	Intermediate Sculpture	4
ART 366	Junior Studio Art Practice	4
ART 409	Advanced 2-D	4
ART 448	Advanced Topics in Sculpture or ART 353 Intermedia / Art	4
ART 466	Senior Studio Art Practice	4

Art History Elective

Select from the following:		4
ART 310	Art History - American Art	
ART 311	Art History - Nineteenth Century Art	
ART 313	Design History	
ART 314	History of Photography	
ART 316	Women as Subject and Object in Art History	
ART 317	Asian Art Survey	
ART 318	Asian Art Topics: National, Religious, and Intellectual Movements	
ART 370	Michelangelo	
ART 371	Topics in Renaissance Art	

ART 373	New Media Art History
Concentration Electives	
Select from the following:	12
At least 8 units must be upper division.	
Any ART courses not already used to meet major or concentration requirements. See course descriptions for repeatable units.	
Total units	52

Art History Minor

Select one survey course in Art History:	4
ART 112	Survey of Western Art
ART 211	Art Hist - Ancient to Renaissance
ART 212	Art History - Renaissance through Baroque Eras
ART 213	Art History- Modern Art, 1900-1945
Select one survey course in Architecture:	4
ARCH 217	History of World Architecture: Prehistory - Middle Ages
ARCH 218	History of World Architecture: Middle Ages - 18th Century
ARCH 219	History of World Architecture: 18th Century - Present
Select one 300-level Non-Western Course:	4
ARCH 320	Topics in Architectural History ¹
ART 317	Asian Art Survey
ART 318	Asian Art Topics: National, Religious, and Intellectual Movements ¹
Select one 300-level Western Course	4
ARCH 320	Topics in Architectural History ¹
ART 310	Art History - American Art
ART 311	Art History - Nineteenth Century Art
ART 315	Art History - Art Since 1945
ART/WGS 316	Women as Subject and Object in Art History
ART 370	Michelangelo
ART 371	Topics in Renaissance Art ¹
Approved Electives	
Select from the following Western or non-Western, architecture or art history classes, at the 300-400 level: ²	12
ARCH 320	Topics in Architectural History ¹
ARCH 420	Seminar in Architectural History, Theory and Criticism
ART 310	Art History - American Art
ART 311	Art History - Nineteenth Century Art
ART 315	Art History - Art Since 1945
ART/WGS 316	Women as Subject and Object in Art History
ART 317	Asian Art Survey
ART 318	Asian Art Topics: National, Religious, and Intellectual Movements ¹
ART 370	Michelangelo
ART 371	Topics in Renaissance Art ¹

ART 373	New Media Art History
Total units	28

- ¹ Repeatable course, taken twice with different topics, can be used to meet different Minor electives. Consult with adviser.
- ² If not used to meet Minor requirements, these courses meet Approved Electives.

Photography Minor

Select from the following:	12
ART 122	Basic Digital Photography
ART 222	Black and White Photography
ART 224	Introduction to Artificial Lighting for Photography
ART 227	Portrait Photography
ART 314	History of Photography ¹
Select from the following:	12
ART 314	History of Photography
ART 324	Photographic Expression
ART 325	Advanced Camera and Lighting Techniques
ART 329	Editorial Photography
ART 373	New Media Art History
ART 383	Digital Video I
ART 427	Advertising Photography
ART 483	Digital Video II
ART 484	Animation, Video, and Interactive Design
Total units	24

- ¹ If selected, course may not be selected again below.

Studio Art Minor

Required Courses	
Select from the following:	12
ART 101	The Fundamentals of Drawing
ART 148	Beginning Sculpture
ART 201	Intermediate Drawing
ART 209	Beginning Painting
ART Approved Electives	
Select from the following:	12
ART 302	Figure Drawing
ART 309	Intermediate Painting
ART 334	Illustration I: Techniques and Tools
ART 348	Intermediate Sculpture
ART 400	Special Problems for Advanced Undergraduates
ART 402	Advanced Figure 2D
ART 409	Advanced 2-D
ART 448	Advanced Topics in Sculpture
or ART 353	Intermedia / Art
Select from the following Art History courses:	4
ART 310	Art History - American Art

ART 311	Art History - Nineteenth Century Art	
ART 315	Art History - Art Since 1945	
ART/WGS 316	Women as Subject and Object in Art History	
ART 317	Asian Art Survey	
ART 318	Asian Art Topics: National, Religious, and Intellectual Movements	
ART 370	Michelangelo	
ART 371	Topics in Renaissance Art	
ART 373	New Media Art History	
Total units		28

Communication Studies

Faculty Office Bldg. (47), Room 33

Phone: 805.756.2553

<https://coms.calpoly.edu>

Department Chair: Bernard K. Duffy

Academic Programs

Program name	Program type
Communication Studies	BA, Minor

Understanding the process of communication is no less important in today's Information Age than it was during the Golden Age of Athens, when skill in oral communication determined one's success in life.

The study of the human capacity for speech as a means of influence, entertainment, and information was at the foundation of Western Civilization. A course of study in communication, always one that required knowledge of many cognate fields such as psychology and logic, remains interdisciplinary in nature. Faculty in Communication Studies teach aesthetic, historical, critical, and empirical methods for understanding communication.

The aims of the discipline are both conceptual and practical. The study of communication embodies the concerns of rhetoric, one of the three original liberal arts. In broad terms, students who enroll in a liberal arts curriculum do so to develop the ability to analyze and reason critically, write and speak effectively, and appreciate the influences of culture upon their lives. The first goal of the department is to advance these objectives.

Courses in the modern discipline of Communication Studies focus on the history, theory and practice of human communication. The field embraces communication in all contexts: political, organizational, debate, small group, intercultural, instructional, mass media, and performance of literature. The emphasis on developing theoretical insights unites these various fields.

The department offers fully articulated major and minor programs. Through the use of approved electives, the major can be shaped to assist students in preparing for their educational and career objectives. Students use a Communication Studies major to prepare for careers in business, advertising and public relations, theatre, law, education, the mass media, and the clergy. In addition to providing students with an option to select from a broad range of internships and the opportunity to participate in the Teaching Credential Program, the department houses an extensive program in competitive debate. It also offers individual and sequenced courses to develop practical skills in oral composition, critical thinking, and effective human communication.

Mission Statement

The general mission of the Communication Studies program is to facilitate students in developing their ability to reason critically, to speak and write effectively, and to understand and appreciate the influences of culture upon their lives. The discipline specific mission of the Communication Studies curriculum is to enhance understanding of the nature, processes and effects of human communication. Multi-dimensional in its approach, the discipline uses the rich resources of both the humanities and the social sciences in exploring the human capacity for speech – when, where, why, how, and with what effect people interact through language and extra-linguistic symbols – and focuses on the theory and practice of human communication in a variety of contexts:

interpersonal, intercultural, instructional, organizational, political, in dyads, in small groups, and in the mass media.

Undergraduate Programs BA Communication Studies

The Bachelor of Arts in Communication Studies degree prepares students for careers in the various communication professions, as well as a wide variety of occupations that place a premium on excellent communication skills. In addition, many Communication Studies graduates go on to earn advanced degrees in disciplines such as communication, psychology, sociology, and law. The Communication Studies curriculum draws from the traditions of both the humanities and the social sciences, and includes a wide array of courses investigating the nature, processes and effects of human communication.

Communication Studies Minor

A 28-unit minor is available for students who desire documented competency in Communication Studies. Further information and application forms are available in the Communication Studies Department office.

BA Communication Studies

Program Learning Objectives

1. Enhanced critical thinking ability.
2. Enhanced competency in written communication.
3. Enhanced competency in oral communication.
4. Enhanced conversation management skills in interpersonal settings.
5. Enhanced competency in small group settings, both as leader and participant.
6. Enhanced ability to develop effective message patterns in organizational settings.
7. Increased understanding of the importance of ethics and values in human communication.

Student Learning Objectives

1. Demonstrate an understanding of classical and contemporary human communication theories.
2. Demonstrate an understanding of communication from a variety of philosophical, historical, theoretical and practical perspectives.
3. Demonstrate an increased sensitivity to multicultural dimensions of communication.
4. Demonstrate an understanding of communication in diverse contexts – interpersonal, small group, public, organizational, and mass media.
5. Demonstrate enhanced analytical, critical and performance competencies that will assist students in participating effectively in a democratic society.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)

- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

Select from the following:	4
COMS 201 Advanced Public Speaking	
COMS 208 Performance of Literature	
COMS 226 Applied Argumentation	
COMS 212 Interpersonal Communication	4
COMS 213 Organizational Communication	4
COMS 217 Small Group Communication	4
COMS 250 Forensic Activity	2
COMS 311 Communication Theory	4
COMS 312 Communication Research Methods	4
COMS 316 Intercultural Communication (USCP)	4
COMS 322 Persuasion	4
COMS 330 Classical Rhetorical Theory	4
COMS 331 Contemporary Rhetorical Theory	4
or COMS 435 American Political Rhetoric	
COMS 332 Rhetorical Criticism	4
COMS 350 Advanced Forensic Activity	2
COMS 385 Media Criticism	4
or COMS 419 Media Effects	
COMS 460 Undergraduate Seminar	1
COMS 461 Senior Project	3
COMS electives (300-400 level) ²	16

SUPPORT COURSES

Upper division writing intensive class	
Select from the following:	4
ENGL 302 Writing: Advanced Composition	
ENGL 310 Corporate Communication	
ENGL 386 Creative Nonfiction	
Modern language 103 (CHIN, FR, GER, ITAL, JPNS, SPAN, WLC) or demonstration of comparable level of proficiency	4
HIST 110 Western Civilization: Ancient to Renaissance	4
Select from the following:	4
HIST 202 United States History Since 1865 (D1) ^{1,3}	
HIST 223 World History, 1800 - Present (D3) ^{1,4}	
PSY 201 General Psychology (D4) ^{1,5}	4
or PSY 202 General Psychology	
STAT 217 Introduction to Statistical Concepts and Methods (B1) ^{1,6}	4

GENERAL EDUCATION (GE)

(See GE program requirements below.) 60

FREE ELECTIVES

Free Electives	24
Total units	180

¹ Required in Support; also satisfies GE.

- ² Only 4 units of supervised instruction, including COMS 400, COMS 450, and COMS 485, may be counted here.
- ³ HIST 202 simultaneously satisfies GE D1.
- ⁴ HIST 223 simultaneously satisfies GE D3.
- ⁵ PSY 201 and PSY 202 simultaneously satisfies GE D4.
- ⁶ STAT 217 simultaneously satisfies 4 units of GE B1.

General Education (GE) Requirements

- 72 units required, 12 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A Communication

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation and Writing	4

Area B Science and Mathematics

B1 Mathematics/Statistics (4 units in Support plus 4 units in GE) ¹	4
B2 Life Science	4
B3 Physical Science	4
B4 One lab taken with either a B2 or B3	0
B5 Area B Elective (select one course from B1-B5)	4

Area C Arts and Humanities

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective (no COMS course)	4

Area D/E Society and the Individual

D1 The American Experience (Title 5, Section 40404 requirement) (0-4 units in Support) ¹	0-4
D2 Political Economy	4
D3 Comparative Social Institutes (0-4 units in Support) ¹	0-4
D4 Self Development (CSU Area E) (4 units in Support) ¹	0
D5 Upper-division elective (no COMS course)	4

Area F Technology

F Upper-division elective	4
Total units	60

¹ Required in Support; also satisfies GE.

Communication Studies Minor

Required Courses

COMS 212 Interpersonal Communication	4
COMS 311 Communication Theory	4
COMS 322 Persuasion	4
COMS 330 Classical Rhetorical Theory	4
or COMS 331 Contemporary Rhetorical Theory	

Approved Electives

12 units of Communication Studies courses, of which at least 8 units must be 300–400 level. ¹	12
Total units	28

- ¹ Only 4 units of supervised instruction, including COMS 400, COMS 450, and COMS 485, may be counted here.

English

Faculty Office Bldg. (47), Room 32-E
Phone: 805.756.2596
<https://english.calpoly.edu>

Department Chair: Kathryn Rummell

Academic Programs

Program name	Program type
English	BA, Minor, MA
Linguistics	Minor

The English Department offers Bachelor of Arts and Master of Arts programs, minors in English and Linguistics, and certificates in Teaching English as a Second Language and in Technical and Professional Communication. Additionally, in cooperation with the School of Education, the department prepares undergraduates and graduates for careers in secondary school teaching. Finally, the English Department provides a wide array of general education courses in composition, literature, film, and creative writing.

An English major or minor is valuable preparation for any career in which critical thinking, nuanced analysis, and clear communication are essential. Many of our majors pursue graduate study in English, education, creative writing, or law; the major provides an excellent foundation for all of these fields. First and foremost, however, students of English are humanists, deeply concerned about the welfare of others. Through imaginatively inhabiting the worlds writers create, English students gain empathy, respect, and perspective, habits of mind that will benefit them throughout their lives.

Certificate Programs

Teaching English as a Second Language (TESL)

The TESL certificate program provides individuals with specialized training to teach successfully in a wide variety of ESL programs. Both undergraduate and graduate students currently enrolled in any degree program at Cal Poly may pursue this certificate.

The 30-unit TESL program provides a solid background in theoretical and applied linguistics, cross-cultural communication, second language acquisition, and methods of TESL. The program is designed for two career options:

1. The Post-Secondary/Adult option prepares individuals to teach in college level and adult education programs. Those wishing to teach at the college level are advised that an MA in English or a related field is the usual minimum requirement for full-time positions.
2. The K-12 option prepares individuals having a single or multiple subject credential to teach ESL in elementary and secondary schools.

Technical Communication

Commercial, academic and governmental organizations employ technical and professional communicators as writers, editors, public relations experts, information designers, documentation and project managers, and as mixed media creators. The technical and professional communicator is, first and foremost, an accomplished writer who produces clear, precise, timely, and effective prose. However, technical communicators also are adept at designing information layouts, integrating images with text, working in teams, translating technical concepts for diverse audiences, and engaging with users to ensure

the usability of documents. Individuals interested in technical and professional communication enjoy the process of continually learning and sharing information with others.

Undergraduate Programs

BA English

The curriculum for the Bachelor of Arts in English offers students both structure and freedom of choice. Students take a required course in world literature and one in linguistics, along with an introduction to literary studies and a six-course sequence of British and American literature. The other eight English courses are chosen by the student and can include creative writing, literature, film, linguistics, composition/rhetoric, and technical and professional communications. A Senior Project in the student's field of interest provides the capstone to the English major.

English majors must also demonstrate intermediate-level proficiency in a language other than English. Cal Poly offers intermediate-level instruction in several languages. We encourage majors to study abroad, and many students choose to complete their language requirement in another country.

Though the core of the major is literature, students may choose an emphasis in fiction- or poetry-writing. The emphasis consists of one introductory workshop, two advanced workshops, one upper-division course in modern or contemporary literature in the student's chosen genre, and the senior project in that genre.

English Minor

An English minor complements any major, adding richness and depth to students' educations. The curriculum boasts literature courses to help students cultivate empathy and insight; writing courses to help students practice essential communication skills; and linguistics courses to provide an understanding of the nature and power of language. Students interested in pursuing an English minor should meet with the minor advisor to review the requirements.

Linguistics Minor

Cal Poly's English Department offers a range of linguistics and applied linguistics courses designed for the beginning linguist or the non-linguist. Linguistics, the science of language, studies our mental capacity to produce and comprehend language, the varied patterns that the world's languages use to express meaning, and the natural facts of diversity and change within and across languages. Applied linguistics in our Department includes teaching English to speakers of other languages, applications of linguistics in the K-12 language arts classroom, history of English, language and gender, and other varied topics.

Linguistics enriches the English major's understanding of and appreciation for English and other languages, not just by acquainting them with the structure of English, but also by exploding popular myths which often lead to ill-informed personal or policy judgments.

Study of linguistics can be useful as preparation for a variety of occupations: teaching language arts, English, or other languages; working in journalism or editing and publishing; and a variety of applications in computer-mediated uses of language.

Master of Arts Degree in English

General Characteristics

This program includes the study of literature, literary criticism, linguistics, and theory of composition. It is designed to provide students with the knowledge and command of English that prepares them specifically for:

- teaching English at the secondary or community college level;
- further graduate work at other institutions;
- employment in business, industry, and government service where effective communication skills are demanded;
- self-directed development in writing.

Prerequisites

Students admitted to the English MA Program must have a bachelor's degree from an accredited institution (or the equivalent, as determined by the English Graduate Committee), have maintained a grade point average of 3.0 for the last 90 quarter units (60 semester units), and a writing sample. Non-native speakers should also submit TOEFL scores (Test of English as a Foreign Language). At the discretion of the graduate coordinator, students without an English major or minor may be admitted conditionally, requiring them to take certain prerequisites prior to taking English graduate classes. The prerequisites required of conditionally-admitted students will be limited to 12 units or fewer.

Program of Study

- 46 units of graduate work approved by the English Graduate Coordinator and the Graduate Committee;
- a cumulative grade point average of 3.0 or better in all courses taken subsequent to admission;
- completion of a graduate project (ENGL 598).

Students elect an emphasis within the Master of Arts program: literature, linguistics, or composition.

Application

Application for admission and requests for further information should be directed to the Admissions Office. All applications should include a writing sample (a critical essay) and three letters of recommendation.

Blended BA + MA English

The blended program provides motivated English majors with an accelerated route to the English MA, with simultaneous conferral of both bachelor's and master's degrees. The blended program allows students to fulfill the baccalaureate program's learning objectives and then transition seamlessly into graduate coursework.

Eligibility

Students majoring in English may be eligible to pursue the blended program toward the English MA. Admission to the program will be based on prior academic performance and other measures of academic promise, with a minimum cumulative GPA of 3.25 and an English major GPA of 3.5 required. Students will be selected by the English Department Graduate Coordinator, in consultation with the English Graduate Committee. Please see Graduate Programs (<http://catalog.calpoly.edu/graduateeducation/#graduateandpostbaccalaureateadmissionrequirements>) for eligibility criteria.

Program of Study

The typical student in the blended program will be able to complete the English BA and MA in five years. Students will complete the senior project by the conclusion of the 4th year and all of the BA degree requirements by the fall of the 5th year. The culminating experience for the English MA will be a supervised graduate project.

BA English

Program Learning Objectives

Learning Outcomes

1. Think critically and creatively about literature and language.
2. Write clearly and effectively about literature and language in a variety of formats.
3. Explicate literary texts from the diverse range of works and traditions.
4. Incorporate scholarly research into papers.
5. Understand a wide range of historical and critical literary and linguistic terms and categories.

Learning Goals

1. Understand how literary texts reflect, critique, and produce culture.
2. Pursue deeper knowledge of particular authors and works.
3. Understand the structure of language and how language varies over time, across social situations and social groups.
4. Participate in face-to-face exchanges of ideas with faculty, fellow students, and authors in the classroom and other academic or social settings.
5. Participate in small seminars where ideas are tested and sharpened.
6. Cultivate relational thinking that encourages students to make connections between the arts and humanities and other fields of study.
7. Sustain a life-long engagement with and delight in literature, art, and culture.
8. Perpetuate an interest and involvement in aesthetic, cultural, and intellectual matters, including social and political issues.
9. Draw upon multiple literacies to interpret literary, visual, and cultural texts.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

ENGL 202	Introduction to Literary Studies	4
ENGL/HNRS 251	Great Books I: Introduction to Classical Literature (C1) ¹	4
ENGL 203	Core I: 450-1485	4
ENGL 204	Core II: 1485-1660	4
ENGL 205	Core III: 1660-1789	4

ENGL 290	Introduction to Linguistics	4
ENGL 303	Core IV: 1789-1861	4
ENGL 304	Core V: 1861-1914	4
ENGL 305	Core VI: 1914 - Present	4
Select from the following:		4
ENGL 345	Women Writers of the Twentieth Century (USCP)	
ENGL 346	Ethnic American Literature (USCP)	
ENGL 347	African American Literature (USCP)	
ENGL 349	Gender in Twentieth Century Literature (USCP)	
ENGL 381	Diversity in Twentieth-Century American Literature (USCP)	
ENGL 382	LGBT Literature and Media (USCP)	
ENGL 300-level electives (see Upper-Division ENGL Units, below)		8
ENGL 461	Senior Project	4
ENGL electives 400-level (see Upper-Division ENGL Units, below) ²		20

SUPPORT COURSES

Foreign language at the Intermediate Level		
Select from the following: ³		4
CHIN 201	Intermediate Mandarin Chinese I	
CHIN 202	Intermediate Mandarin Chinese II	
FR 201	Intermediate French I	
FR 202	Intermediate French II	
GER 201	Intermediate German I	
GER 202	Intermediate German II	
ITAL 201	Intermediate Italian I	
JPNS 201	Intermediate Japanese I	
SPAN 201	Intermediate Spanish I	
SPAN 202	Intermediate Spanish II	

GENERAL EDUCATION (GE)

(See GE program requirements below.) 68

FREE ELECTIVES

Free Electives	36
Total units	180

¹ Required in Major; also satisfies GE.² Minimum 12 units in literature.³ Student can substitute for this requirement by demonstrating a comparable level of proficiency in a foreign language.

Upper-Division ENGL Units

English majors are encouraged to use their upper-division ENGL electives to pursue their interests, including literature, creative writing, linguistics, and/or rhetoric and writing. Students may choose any 300-level English courses they wish to satisfy the 300-level elective requirement. At the 400-level, students must take a minimum of 12 units of literature courses (430, 431, 432, 439, 449, 459).

Students interested in creative writing may use 16 of their upper-division ENGL units and their senior project to pursue a fiction- or poetry-writing emphasis. Examples are:

Fiction Writing Emphasis:

ENGL 387	Fiction Writing (4)
ENGL 487	Advanced Creative Writing: Fiction (4, 4)
400-level ENGL literature course in modern or contemporary fiction (4)	
ENGL 461	Senior Project (4)
Poetry Writing Emphasis:	
ENGL 388	Poetry Writing (4)
ENGL 488	Advanced Creative Writing: Poetry (4, 4)
400-level ENGL literature course in modern or contemporary poetry (4)	
ENGL 461	Senior Project (4)

General Education (GE) Requirements

- 72 units required, 4 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics	8
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5)	4
Area C	Arts and Humanities	
C1	Literature (4 units in major) ¹	0
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective (no ENGL course)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		68

¹ Required in Major; also satisfies GE.

English Minor

Required Courses

Great Books (C1)

Select from the following: 4

ENGL 251	Great Books I: Introduction to Classical Literature
ENGL 252	Great Books II: Medieval to Enlightenment Literature
ENGL 253	Great Books III: Romanticism to Modernism Literature

British Literature (C4)

Select from the following: 4

ENGL 330	British Literature in the Age of Belief: to 1485
ENGL 331	British Literature in the Age of Discovery: 1485-1660
ENGL 332	British Literature in the Age of Enlightenment: 1660-1798
ENGL 333	British Literature in the Age of Romanticism: 1798-1832
ENGL 334	British Literature in the Age of Industrialism: 1832-1914
ENGL 335	British Literature in the Age of Modernism: 1914-Present
ENGL 339	Introduction to Shakespeare

American Literature (C4)

Select from the following: 4

ENGL 340	The Literary Sources of the American Character: 1600-1865
ENGL 341	The Literary Sources of the American Character: 1865-1914
ENGL 342	The Literary Sources of the American Character: 1914-1956
ENGL 343	Multiple Voices of Contemporary American Literature
ENGL 346	Ethnic American Literature
ENGL 347	African American Literature

World Literature, Modern Literature and/or Film (C4)

Select from the following: 4

ENGL 345	Women Writers of the Twentieth Century
ENGL 349	Gender in Twentieth Century Literature
ENGL 350	The Modern Novel
ENGL 351	Modern Poetry
ENGL 352	Modern Drama
ENGL 370	World Cinema
ENGL 371	Film Styles and Genres
ENGL 372	Film Directors
ENGL 381	Diversity in Twentieth-Century American Literature
ENGL 382	LGBT Literature and Media

Linguistics

Select from the following: 4

ENGL 390	The Linguistic Structure of Modern English
ENGL 395	History of the English Language

Composition, Creative Writing, Technical Communications

Select from the following: 4

ENGL 302	Writing: Advanced Composition
ENGL 310	Corporate Communication
ENGL 317	Technical Editing
ENGL 319	Information Design and Production
ENGL 386	Creative Nonfiction
ENGL 387	Fiction Writing
ENGL 388	Poetry Writing

Elective

One additional 4-unit course from the lists above 4

Total units 28

Linguistics Minor

Required Courses

ENGL 290	Introduction to Linguistics	4
ENGL 391	Topics in Applied Linguistics	4
ENGL 395	History of the English Language	4

Approved Electives¹

May include (at least 6 units must be at the 300-400 level): 16

COMS 316	Intercultural Communication
ENGL 390	The Linguistic Structure of Modern English
ENGL 495	Topics in Applied Language Study
ENGL 497	Theories of Language Learning and Teaching

Total units 28

¹ Select approved electives in consultation with faculty advisor.

MA English

Required Courses

ENGL 501	Introduction to English Studies	4
ENGL 502	Seminar in Critical Analysis	4
ENGL 503	Graduate Introduction to Linguistics	4
ENGL 505	Composition Theory	4
ENGL 511	Seminar in American Literary Periods ¹	4
ENGL 512	British Literary Periods ¹	4
ENGL 598	Graduate Project	2

Select from the following:¹ 8

ENGL 510	Seminar in Authors
ENGL 511	Seminar in American Literary Periods
ENGL 512	British Literary Periods
ENGL 513	Seminar in Special Topics

English Electives

Additional 400-and 500-level courses, to be selected from one of the three emphasis areas: literature, composition or linguistics 12

Total units 46

- ¹ Students should consult with an advisor to select two pre-1800 literature courses and two post-1800 literature courses in the four required literature courses.

Ethnic Studies

Math and Science Bldg. (38), Room 136

Phone: 805.756.1707

<https://ethnicstudies.calpoly.edu>

Department Chair: Denise A. Isom

Academic Programs

Program name	Program type
Comparative Ethnic Studies	BA
Ethnic Studies	Minor
Indigenous Studies in Natural Resources and the Environment	Minor

The Ethnic Studies Department uses inter- and multidisciplinary approaches to study the lives of Indigenous, African, Latino/a, and Asian peoples in the United States within a global and postcolonial context.

The Ethnic Studies curriculum provides students with unique forms of critical inquiry that advance their analysis of race, ethnicity, and cultural difference in an increasingly heterogeneous and complex world. Courses in Ethnic Studies examine how social hierarchies frame access to political power, allocate economic resources, and influence cultural expression. By critically exploring such issues, students develop not only a greater understanding of the legacy of racism, discrimination, and injustices in the United States, but also a greater appreciation for new and emerging knowledge about diverse American peoples and their global and transnational connections.

Housed in the College of Liberal Arts, the Ethnic Studies Department at Cal Poly encourages critical dialogue about race, ethnicity, postcoloniality, and transnationalism across the entire university curriculum, with special focus on concepts that integrate the arts, humanities, and social sciences, as well as the sciences and technology. The department offers a number of courses that fulfill both general education and United States Cultural Pluralism requirements. A minor in Ethnic Studies is open to all majors and provides a useful complement to the differing types of inquiry used in the wide variety of disciplines throughout the University.

Undergraduate Programs

BA Comparative Ethnic Studies

It is expected that students who demonstrate the foregoing learning outcomes will be better prepared to understand the social, cultural, political, historical, and economic factors that have shaped their own social and occupational identities, as well as the social and occupational identities of others. This knowledge should better prepare students to work, collaborate, and interact more responsibly and effectively in an increasingly diverse and globalized workplace and world.

Ethnic Studies Minor

An Ethnic Studies minor provides students with special competence in the histories and experiences of diverse communities and the critical skills with which to understand complex social issues. Students majoring in subjects across the university curriculum find Ethnic Studies useful, particularly when their interests require a deeper understanding of race, ethnicity, and diversity in the United States and beyond. The minor prepares students for careers in education, government, and community organizations; for entrance to professional schools in areas such as law,

social work, and health; and for graduate studies in all areas of the arts and sciences.

Indigenous Studies in Natural Resources and the Environment Minor

An interdisciplinary minor sponsored by the departments of Natural Resources Management and Environmental Sciences and Ethnic Studies. For more information, see the Natural Resources Management and Environmental Sciences (p. 127) section.

BA Comparative Ethnic Studies

Program Learning Objectives

It is expected that students who demonstrate the foregoing learning outcomes will be better prepared to understand the social, cultural, political, historical, and economic factors that have shaped their own social and occupational identities, as well as the social and occupational identities of others. This knowledge should better prepare students to work, collaborate, and interact more responsibly and effectively in an increasingly diverse and globalized workplace and world.

1. Demonstrate an ability to define key concepts, terms, and scholarship in the Ethnic Studies discipline today, including a critical understanding of the ways in which social, cultural, political, and economic factors construct historical and contemporary meanings of race, class, gender, and sexuality in the United States, as well as the ways in which these meanings shape and are shaped by scientific and technical knowledge production and educational and professional practices.
2. Employ these key concepts and terms to conduct independent analyses of historical and contemporary texts, the arts, popular culture, and social and occupational interactions.
3. Critically analyze discourses, ideologies, and practices that maintain or increase economic, social, political, legal, educational, environmental, scientific and technological inequality.
4. Engage with and create new knowledge that explores and promotes the expression of new social or cultural identities and cultural literacy in a multi-racial, multi-cultural society.
5. Engage with and create new knowledge that explores and promotes cultural, social, political, and economic self-determination and self-representation of underrepresented groups, the expansion of human rights in a national and global context, and the diversity of cultural and social practices that promote social, economic, and environmental sustainability.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

ES 112	Race, Culture and Politics in the United States (D1) (USCP) ¹	4
ES 114	Introduction to Ethnic Studies: Race in the United States	4
Survey Electives		
Select from the following:		12
ES 241	Survey of Indigenous Studies (D3) (USCP) ¹	
ES 242	Survey of Africana Studies (D3) (USCP) ¹	
ES 243	Survey of Latino/a Studies (D3) (USCP) ¹	
ES 244	Survey of Asian American Studies (D3) (USCP) ¹	
Cultural Electives		
Select from the following:		8
ES 320	African American Cultural Images	
ES 321	Native American Cultural Images	
ES 322	Asian American Cultural Images	
ES 323	Mexican American Cultural Images	
ES 340	Cultural Production and Ethnicity	
ES 350	Gender, Race, Culture, Science and Technology (Area F) (USCP) ¹	4
ES 380	Critical Race Theory	4
ES 381	The Social Construction of Whiteness	4
ES 390	Research Methodology in Comparative Ethnic Studies	4
ES 450	Fieldwork in Comparative Ethnic Studies	4
ES 461	Senior Project	4
Upper division Ethnic Studies electives ^{2,3}		12
Approved Electives ^{2, 3, 4, 5}		20
See approved electives list below		
SUPPORT COURSES		
Language other than English (all 8 units must be in the same language)		8
STAT 217	Introduction to Statistical Concepts and Methods (B1) ¹	4
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		56
FREE ELECTIVES		
Free Electives		28
Some free electives may need to be 300-400 level to ensure completion of the required minimum of 60 units upper division. Consult college advisor for additional information.		
Total units		180

Approved Electives

Select from the following: ^{2, 3, 4, 5}		20
AG/EDES/ENGR/	The Global Environment	
ISLA/SCM/UNIV		
350		

AGB 370	World Food Economy
ANT 201	Cultural Anthropology
ANT 325	Pre-Columbian Mesoamerica
ANT 415	Native American Cultures
ARCH 320	Topics in Architectural History
ART 317	Asian Art Survey
ART 318	Asian Art Topics: National, Religious, and Intellectual Movements
BUS 402	International Business Management
BUS 403	Advanced Seminar in International Management
BUS 407	Managing People in Global Markets
BUS 433	International Finance
BUS 446	International Marketing
CD/EDUC 207	Children's Learning and Development in Educational Settings
COMS 316	Intercultural Communication
COMS 319	Critical Cultural Studies and Communication
CRP 334	Cities in a Global World
DANC 321	Cultural Influence on Dance in America
ECON 330	International Trade Theory
ECON/HNRS 303	Economics of Poverty, Discrimination and Immigration
EDES 406	Sustainable Environments
ENGL 345	Women Writers of the Twentieth Century
ENGL 346	Ethnic American Literature
ENGL 349	Gender in Twentieth Century Literature
ENGL 347	African American Literature
ERSC/GEORG 325	Climate and Humanity
ES/HNRS 212	Global Origins of United States Cultures
ES/NR 308	Fire and Society
ES/WGS 345	Queer Ethnic Studies
ES/NR 360	Ethnicity and the Land
ES/NR 406	Indigenous Peoples and International Law and Policy
GEOG 150	Human Geography
GEOG 300	Geography of United States
GEOG 308	Global Geography
GEOG 340	Geography of California
GEOG 370	Geography of Latin America
GEOG 380	Geography of the Caribbean
HIST 206	American Cultures
HIST 214	Political Economy of Latin America and the Middle East
HIST 310	East Asian Culture and Civilization
HIST 314	Middle East
HIST 337	Colonial Latin America
HIST 338	Modern Latin America
HIST 341	Modern Central America

HIST 405	African-American History to 1865
HIST 406	African-American History from 1865
HIST 416	Modern Japan
HIST 417	20th Century China
HIST 418	Chinese Film and History
HIST 429	Precolonial African History
HIST 430	Modern African History
HIST 443	Topics and Issues in Asian History
HIST/HNRS 207	Freedom and Equality in American History
HIST/HNRS 223	World History, 1800 - Present
HIST/WGS 434	American Women's History to 1870
HIST/WGS 435	American Women's History from 1870
KINE 255	Personal Health: A Multicultural Approach
JOUR 401	Global Communication
MU 121	Introduction to Non-Western Musics
MU 221	Jazz Styles
MU 229	Music of the 60's: War and Peace
MU 325	America's Music
MU 336	Jazz History and Theory
PHIL 320	Asian Philosophy
POLS 225	Introduction to International Relations
POLS 229	Introduction to Comparative Politics
POLS 310	The Politics of Race, Class, Gender and Sexuality
POLS 324	International Relations Theory
POLS 325	Global Political Issues
POLS 328	Politics of Developing Areas
POLS 339	Authoritarian and Democratic Rule
POLS 343	Civil Rights in America
POLS 419	Social Movements and Political Protest
POLS 420	Contemporary U.S. Foreign Policy
POLS 427	Politics of the Global Economy
POLS/UNIV 333	World Food Systems
PSY 304	Intergroup Dialogues
PSY 465	Cross-Cultural International Psychology
RELS 302	Abrahamic Religions: Judaism, Christianity, and Islam
RELS 306	Hinduism
RELS 307	Buddhism
RELS/WGS 370	Religion, Gender, and Society
SOC 110	Comparative Societies
SOC 218	International Political Economy
SOC 309	The World System and Its Problems
SOC 315	Global Race and Ethnic Relations
SOC 316	American Ethnic Minorities
SOC 323	Social Stratification
SOC 350	Social Organization of Modern Japan

SPAN 233	Introduction to Hispanic Readings
SPAN 305	Significant Works in Spanish
SPAN 340	Chicano/a Authors
SPAN 350	Hispanic Literature in English Translation
SPAN 351	Chicano/Latino Writers in the United States
SPAN 410	Advanced Literature in Spanish
TH 390	Global Theatre and Performance
WGS 301	Contemporary Issues in Women's and Gender Studies
WGS 320	Women, Gender and Sexuality in Global Perspective
WGS 450	Feminist Theory
WLC 312	Humanities in Chicano/a Culture

- ¹ Required in Major/Support; also satisfies GE
- ² Be aware that some courses on this list may have prerequisites and that these prerequisites may need to be used as free electives.
- ³ Consultation with advisor is recommended prior to selecting electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
- ⁴ These 20 units of Approved Electives can be chosen from any unused ES prefix course or from the Approved Electives listed above. Courses not on the approved elective list may still be chosen, but are subject to department approval.
- ⁵ If GE courses are taken for a letter grade and used as Approved Electives to satisfy Major requirements, additional free elective units may be required to complete the 180 total unit requirement. Consult college advisor for additional information.

General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (4 units in Support plus 4 units in GE) ¹	4
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5)	4
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective (no ES course except ARCH/ES 326 or ES/NR 360)	4

Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (4 units in Major) ¹	0
D2	Political Economy	4
D3	Comparative Social Institutions (4 units in Major) ¹	0
D4	Self Development (CSU Area E)	4
D5	Upper-division elective (no ES course except ES/NR 308)	4
Area F	Technology	
F	Upper-division elective (4 units in Major)	0
Total units		56

¹ Required in Major/Support; also satisfies GE

Ethnic Studies Minor

Required Courses

ES 112	Race, Culture and Politics in the United States	4
ES 212	Global Origins of United States Cultures	4
or ES 241	Survey of Indigenous Studies	
or ES 242	Survey of Africana Studies	
or ES 243	Survey of Latino/a Studies	
or ES 244	Survey of Asian American Studies	
ES 320	African American Cultural Images	4
or ES 321	Native American Cultural Images	
or ES 322	Asian American Cultural Images	
or ES 323	Mexican American Cultural Images	
or ES 340	Cultural Production and Ethnicity	
or ES 380	Critical Race Theory	
or ES 381	The Social Construction of Whiteness	

Approved Electives ^{1, 2}

Electives (8 units must be at the 300-400 level)	12
Total units	24

¹ Electives reinforce and enhance student understanding of issues of culture, race, and gender.

² Approved electives include courses listed above not used to meet minor requirements, any unused ES prefix course, or any course on the list of approved electives for Comparative Ethnic Studies (p. 273) majors.

Graphic Communication

Graphic Arts Bldg. (26), Room 201
Phone: 805.756.1108; Fax: 805.756.7118
<http://www.grc.calpoly.edu/>

Department Chair: Kenneth L. Macro

Academic Programs

Program name	Program type
Graphic Communication	BS, Minor

The Graphic Communication Department offers a curriculum leading to the Bachelor of Science degree, yet the discipline is both an art and a science. It appeals to students having an interest in creativity, science, technology, and management.

The Graphic Communication Department occupies approximately 33,000 square feet of laboratories in the Graphic Arts Building and in the adjacent web press building. Theory and practice are taught in modern classrooms incorporating the latest in teaching techniques. Fourteen well-equipped laboratories provide students with diverse experiences in the practical aspects of graphic media development and functional printing.

The Graphic Communication Department receives support from an advisory board comprised of industry leaders representing major graphic communication companies.

Undergraduate Programs

BS Graphic Communication

The field of graphic communication represents a large profession, one of the largest in the world. The profession embraces change, requiring those pursuing graphic communication careers to learn new and diverse skills. Graphic communication includes digital and conventional printing, publishing, packaging, digital imaging, computer graphics, digital design, digital photography, printable electronics, functional imaging, web and app development, user interface and user experience design, human-computer interaction design, and related areas. The discipline includes media and mass communication involving the creation, production, management, and distribution of advertising, marketing, websites, apps, books, magazines, newspapers, catalogs, packages, printed electronics, and other media in printed and digital form. Graduates are in high demand by leading national and international corporations in the graphic communication field.

The Bachelor of Science program in Graphic Communication is accredited by the Accreditation Council for Collegiate Graphic Communications, Inc. (ACCGC), an independent body dedicated to the improvement and recognition of collegiate level curricula in graphic communication.

Beyond acquiring a foundation in graphic communication, students select a specialization among the department's concentrations of design reproduction technology, web and digital media, graphic communication management, packaging graphics, and individualized study in graphic communication.

Concentrations

BS Majors select one of the following concentrations based upon their interests and career goals.

Design Reproduction Technology¹

Emphasis on design and technology for print and web publishing. Coursework includes typography, branding, color theory, and design for packaging and for the publication of books, magazines, and web sites.

¹ The Graphic Communication Department's Design Reproduction Technology concentration focuses on the technical and electronic aspects of transforming design for reproduction in print and digital media. The concentration focuses on printing, web development, publishing, packaging, digital imaging, computer graphics, and related areas of mass media preparation and production. The Art and Design Department's Graphic Design concentration focuses on creative problem-solving and development of design and layout skills. The concentration leads to positions such as graphic designer, web designer, art director and creative director for advertising agencies, design studios and corporate design departments.

Graphic Communication Management

A flexible program for students interested in management careers in the graphic communication industry. In addition to the major requirements in graphic communication, coursework includes multiple business management related disciplines. Graduates are in high demand throughout the country from publishing, design, printing, packaging, and web-based commerce firms, including their customers and suppliers.

Graphics for Packaging

Designed for students who desire a career in the growing field of package graphics and printing. This program provides students with the opportunity to learn all components of graphic preparation for packaging, print reproduction and conversion, while also providing aspects of structural design and food safety. Consumer and industrial print packaging is addressed.

Web and Digital Media

Emphasis on the latest trends in web development and the production and distribution of digital media. In addition to major requirements, course-work includes the study of web technology and design, digital audio, animation, photography, interactive entertainment, and video. The concentration leads to careers in web development, digital media production and management, and opportunities with hardware and software manufacturers that service the graphic communication industry.

Individualized Course of Study

An opportunity to pursue a course of study that meets a student's individual needs and interests.

Graphic Communication Minor

A minor in Graphic Communication benefits students interested in pursuing careers in graphic communication or who anticipate using graphic communication skills in another career. Students in the minor have a competitive edge when applying for many jobs by understanding concepts, and gaining knowledge and skills in web and print media. Additionally, students develop an understanding of the effective design and reproduction technologies, practical file preparation for various output processes including web and print media. In addition, students

will gain an understanding of typography, digital photography, and color management. Information and application forms for this minor are available in the Graphic Communication Department office.

Graduate Program

MBA, Graphic Communication Document Systems Management Specialization

In cooperation with the Orfalea College of Business, a student can earn an MBA with a graphic communication emphasis in document systems management. This program is designed to prepare professionals having diverse backgrounds with a strong and advanced business orientation along with a grounding in graphic communication. For more information, see the Orfalea College of Business (p. 175) section.

BS Graphic Communication

Program Learning Objectives

1. Critically and creatively design, produce and critique GrC solutions based on theoretical foundations, modern practice and critical understanding of market and societal trends.
 - Create and/or integrate graphic and functional design to enhance adoption or user experience for GrC products and services via effective usage of imagery, type, function and appropriate design principles.
 - Develop creative business or production strategies that effectively address existing or emerging GrC markets.
2. Effectively communicate GrC concepts in oral, written and visual form in both group and individual settings.
 - Effectively articulate and defend professional writing, and visual and oral presentations in various stages and forms, including content development, market research, experimental research, team facilitation, leadership development, visual representation and technology analysis.
3. Develop, evaluate and justify appropriate production/development strategies in GrC.
 - Identify, evaluate and implement various "output" strategies for graphic media and industrial products.
 - Develop technical and process expertise, including specification and content development strategies, for graphic and manufacturing processes.
 - Design and produce aesthetically pleasing graphic media that combine brand and market awareness with best practices in visual communication, demonstrating skill development in creative software usage.
 - Contrast professional hardware and software workflow technologies against required specifications and tolerances to determine appropriateness for requirements.
4. Evaluate and fundamental business practices for graphic communication.
 - Evaluate fundamental business, finance and management principles related to starting and developing a GrC business.

5. Demonstrate reasoned responses to current environmental and societal challenges.
 - Make reasoned positive contributions to current societal and corporate challenges in GrC, specifically related to diversity in the workforce and sustainable practices in GrC.
6. Locate, analyze, and synthesize market trends and continuous learning opportunities in GrC.
 - Analyze applications, trends, and market drivers in GrC.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

GRC 101	Introduction to Graphic Communication	3
GRC 172	Introductory Applied Graphic Communication Processes	2
GRC 201	Digital Publishing Systems	3
GRC 203	Digital File Preparation and Workflow	4
GRC 204	Introduction to Contemporary Print Management and Manufacturing	4
GRC 211	Substrates, Inks and Toners	4
GRC 301	Digital Photography and Color Management	4
GRC 316	Flexographic Printing Technology	3
GRC 318	Digital Typography for Print and Web	4
GRC 320	Managing Quality in Graphic Communication	4
GRC 324	Binding and Finishing Processes	1
GRC 328	Offset Printing Technology	4
GRC 329	Printed Electronics	3
GRC 337	Consumer Packaging	3
GRC 338	Web Development and Content Management	4
GRC 361	Marketing and Sales Management for Print and Digital Media	4
GRC 372	Applied Graphic Communication Practices	2
GRC 402	Digital Printing and Emerging Technologies in Graphic Communication	3
GRC 403	Estimating for Print and Digital Media	4
GRC 411	Strategic Trends and Profitability Issues in Print and Digital Media	4

GRC 422	Human Resource Management Issues for Print and Digital Media	4
Senior Project		
Select from the following:		3
GRC 461	Senior Project - Independent Study	
GRC 462	Senior Project	
GRC 463	Senior Project - Applied Practices	
Concentration Courses		29
SUPPORT COURSES		
CHEM 110	World of Chemistry (B3&B4) ¹	4-5
or CHEM 111	Survey of Chemistry	
MATH 118	Precalculus Algebra (B1) ^{1,2}	4
PHYS 104	Introductory Physics (B3)	4
or PHYS 121	College Physics I	
STAT 217	Introduction to Statistical Concepts and Methods (B1) ¹	4
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		56
FREE ELECTIVES		
Free Electives		4-5
Total units		180

¹ Required in Support; also satisfies GE.

² MATH 116 and MATH 117 substitute.

Concentrations

- Design Reproduction Technology (p. 279)
- Graphic Communication Management (p. 279)
- Graphics for Packaging (p. 280)
- Web and Digital Media (p. 280)

Individualized Course of Study

This concentration consists of 29 units; a minimum of 18 units must be upper division and a minimum of 8 units must be Graphic Communication. The student selects the courses in consultation with the concentration coordinator and department head, and provide written justification for the courses and the way they constitute a cohesive, integrated program of study. The list of courses serves as a contract between the student and the Graphic Communication Department.

General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Support)	0

B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5) (4 units in Support) ¹	0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective (no GRC course)	4
Total units		56

¹ Required in Support; also satisfies GE

Design Reproduction Technology Concentration

ART 102	Art and Design Foundation Studies I	4
ART 103	Art and Design Foundation Studies II	4
GRC 339	Web Design and Production	4
GRC 439	Book Design Technology	4
GRC 440	Magazine Design Technology	4
Select from the following:		9
GRC 322	Advanced Digital Typography	
GRC 331	Color Management and Quality Analysis	
GRC 429	Digital Media	
GRC 451	Management Topics in Graphic Communication	
GRC 452	Emerging Technologies in Graphic Communication	
GRC 453	Design Reproduction Topics in Graphic Communication	
Other courses as approved by academic advisor		
Total units		29

Graphic Communication Management Concentration

BUS 207	Legal Responsibilities of Business	4
BUS 212	Financial Accounting for Nonbusiness Majors	4
BUS 382	Organizations, People, and Technology	4
COMS 213	Organizational Communication	4

GRC 421	Production Management for Print and Digital Media	4
Select from the following:		9
BUS 303	Introduction to International Business	
BUS 310	Introduction to Entrepreneurship	
ENGL 310	Corporate Communication	
GRC 220	Introduction to Applied Social Media in Graphic Communication	
GRC 357	Specialty Printing Technologies	
GRC 451	Management Topics in Graphic Communication	
GRC 452	Emerging Technologies in Graphic Communication	
Other courses as approved by academic advisor		
Total units		29

Graphics for Packaging Concentration

FSN 354	Packaging Function in Food Processing	3
GRC 357	Specialty Printing Technologies	3
GRC 421	Production Management for Print and Digital Media	4
ITP 330	Packaging Fundamentals	4
ITP 408	Paper and Paperboard Packaging	4
Approved Electives		
Select from the following:		11
GRC 331	Color Management and Quality Analysis	
GRC 452	Emerging Technologies in Graphic Communication	
ITP 341	Packaging Polymers and Processing	
ITP 411	Packaging Sustainability	
ITP 430	Healthcare Packaging	
ITP 475	Packaging Performance Testing	
Other courses as approved by academic advisor		
Total units		29

Web and Digital Media Concentration

CPE/CSC 101	Fundamentals of Computer Science	4
CPE/CSC 123	Introduction to Computing	4
GRC 339	Web Design and Production	4
GRC 429	Digital Media	3
Advisor Approved Electives		
Select from the following:		14
CSC courses (any, up to 8 units)		
ART 122	Basic Digital Photography	
ART 383	Digital Video I	
ART 388	Interaction Design II	
ART 483	Digital Video II	

ART 484	Animation, Video, and Interactive Design	
ART 488	Interaction Design III	
GRC 220	Introduction to Applied Social Media in Graphic Communication	
GRC 331	Color Management and Quality Analysis	
GRC 400	Special Problems for Advanced Undergraduates	
GRC 451	Management Topics in Graphic Communication	
GRC 452	Emerging Technologies in Graphic Communication	
GRC 453	Design Reproduction Topics in Graphic Communication	
Total units		29

¹ Only during Winter quarter may GRC students enroll in CPE/CSC 123.

Graphic Communication Minor

Required Courses		
GRC 101	Introduction to Graphic Communication	3
GRC 212	Substrates, Inks and Toners: Theory	3
GRC 301	Digital Photography and Color Management	4
GRC 318	Digital Typography for Print and Web	4
GRC 324	Binding and Finishing Processes	1
GRC 328	Offset Printing Technology	4
GRC 377	Web and Print Publishing	4
Approved Electives		
Select from the following:		2-4
GRC 172	Introductory Applied Graphic Communication Processes	
GRC 220	Introduction to Applied Social Media in Graphic Communication	
GRC 331	Color Management and Quality Analysis	
GRC 357	Specialty Printing Technologies	
Total units		25-27

History

Faculty Office Bldg. (47), Room 27C

Phone: 805.756.2543

<https://history.calpoly.edu>

Department Chair: Kathleen Murphy

Academic Programs

Program name	Program type
Asian Studies	Minor
History	BA, MA, Minor

Historians study the past in its variety and complexity. With such an analysis, students of history gain multiple perspectives on the present and an aptitude to plan intelligently for the future. Although the lessons to be learned from the past are rarely simple, solutions to present-day problems rest on comprehension of historical forces and events. History deepens our understanding of other peoples and cultures. All courses offered in the History Department seek to examine the issues of race, gender, class, and cultural diversity.

The study of history and its methods prepares students for a wide range of careers while also sensitizing them to the complexity and diversity of the past and present. History is an excellent foundation for a broadly based education in the liberal arts.

Undergraduate Programs

BA History

A degree in history is excellent preparation for students interested in a teaching career, the legal profession, or advanced work in the discipline. Students wishing to become business executives, administrators, and public servants profit immensely by gaining the methodological skills of the historian. Historians learn to gather, synthesize, analyze, and interpret evidence; they become skilled in presenting their conclusions to a general audience in a lucid and logical manner.

Asian Studies Minor

Provides interdisciplinary understanding of Asia – particularly its rich and varied histories, arts, languages, philosophies, religions and social patterns. Details and application forms are available from the History Department.

History Minor

Students choosing to add a strong historical dimension to their major field may enroll in the minor program in history. The curriculum stresses reading and writing skills as well as the ability to weigh evidence and think critically. Details and application forms are available from the History Department.

Master of Arts Degree in History

General Characteristics

The program in history emphasizes concentrated study in area specialties, with students gaining a thorough grounding in the latest historiography. In addition, the program maintains that historical study must be predicated upon sustained research, engagement with historical

problems, and written communication. Completion of the MA program in history will allow students the following options:

- Teach history at the elementary, secondary, or community college level.
- Give students the critical skills and knowledge to enter into the worldwide information economy.
- Allow community members to expand their historical knowledge.
- Prepare students for transfer to Ph.D. programs at other universities.

Prerequisites

Admission to the MA program requires:

Possession of an undergraduate degree from an accredited college or university. An overall grade point average of 3.0 for the last 90 units of undergraduate work. Submission of a writing sample, in the form of a senior project or upper division paper. Related undergraduate coursework. Students without an undergraduate degree in history are required to demonstrate adequate preparation for graduate study in history, as determined by the Graduate Coordinator.

Program of Study

- 48 units of graduate work in areas specified (49 units for those students writing a MA Thesis).
- a grade point average of at least 3.0 after 12 units of graduate coursework.
- MA Thesis or Comprehensive Examinations in two distinct areas of study.

Foreign Language Study

Students are encouraged to learn and use foreign languages in the MA program. Students who plan further graduate study in history are particularly encouraged in this direction since proficiency in two foreign languages is usually required in doctoral programs.

Applications

Applications for admission and requests for further information should be directed to the Admissions Office or the Graduate Coordinator of the MA History program. All applications should include a writing sample (preferably an extended research paper) and undergraduate transcripts.

BA History

Program Learning Objectives

1. Understand and analyze the sources used by historians.
2. Understand how to synthesize historical information.
3. Understand how to design, research, and produce an original research paper.
4. Understand multiple perspectives.
5. Understand chronological and spatial thinking.
6. Understand historiography / historical interpretations.
7. Understand content knowledge.
8. Understand historical change, understand themselves and their lives in historical context, and develop a sense of the past that can sustain them today.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

HIST 100	Introduction to the Study of History	2
HIST 110	Western Civilization: Ancient to Renaissance	4
HIST 111	Western Civilization: Reformation to the Present	4
HIST 201	United States History to 1865 (D1) (USCP) ¹	4
HIST 202	United States History Since 1865 (D1) (USCP) ¹	4
HIST 213 or HIST 214	Modern Political Economy (D2) ¹ Political Economy of Latin America and the Middle East	4
HIST 221 or HIST 222 or HIST 223	World History, Beginnings to 1000 (D3) ¹ World History, 1000 - 1800 World History, 1800 - Present	4
HIST 303	Research and Writing Seminar in History	5
HIST 304	Historiography	4
HIST 460	Senior Project I	2
HIST 461	Senior Project II	2

History Electives

Select upper division HIST courses	24
Select a minimum of 12 units at the 400 level ²	
Select a minimum of 12 units from the following Non-U.S., Non-European courses	
HIST 308	The Trans-Atlantic Slave Trade
HIST 309	Cultures of West Africa and the African Diaspora
HIST 310	East Asian Culture and Civilization
HIST 314	Middle East
HIST 316	Modern East Asia
HIST 317	The Lure of the Sea
HIST 319	Modern South and Southeast Asia
HIST 337	Colonial Latin America
HIST 338	Modern Latin America
HIST 341	Modern Central America
HIST 409	Vietnam War at Home and Abroad
HIST 416	Modern Japan
HIST 417	20th Century China
HIST 418	Chinese Film and History
HIST 419	Modern Southeast Asia

HIST 421	The History of Prostitution
HIST 422	Japanese Postwar Film and History
HIST 423	The History of Vietnam
HIST 428	The Indian Ocean
HIST 429	Precolonial African History
HIST 430	Modern African History
HIST 442	Topics and Issues in Latin American History
HIST 443	Topics and Issues in Asian History
HIST 444	Topics and Issues in African History
HIST 445	Topics and Issues in Comparative History
HIST 459	Imperialism and Postcolonial Studies
HIST 475	Arabia and the Arab Gulf States

Foreign Language Requirement

Select from the following:	4
CHIN 201	Intermediate Mandarin Chinese I
FR 201	Intermediate French I
GER 201	Intermediate German I
ITAL 201	Intermediate Italian I
JPNS 201	Intermediate Japanese I
SPAN 201	Intermediate Spanish I
WLC 201	Intermediate World Language I
or equivalent course	

SUPPORT COURSES

Any upper division courses (300-400, including History) ³	24
--	----

GENERAL EDUCATION (GE)

(See GE program requirements below.)	60
--------------------------------------	----

FREE ELECTIVES

Free Electives ^{3,4}	29
Total units	180

¹ Required in Major; also satisfies GE.

² Excluding HIST 400, HIST 467, HIST 485, HIST 495.

³ If upper-division GE courses are used to satisfy Major or Support requirements, additional units may be required to complete the 180 total unit requirement.

⁴ Upper division GE courses taken for a letter grade satisfy support course requirements which would cause free electives to become 41 rather than 29 units. Consult college advisor for additional information.

General Education (GE) Requirements

- 72 units required, 12 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics	8

B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5)	4
Area C Arts and Humanities		
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E Society and the Individual		
D1	The American Experience (Title 5, Section 40404 requirement) (4 units in Major) ¹	0
D2	Political Economy (4 units in Major) ¹	0
D3	Comparative Social Institutions (4 units in Major) ¹	0
D4	Self Development (CSU Area E)	4
D5	Upper-division elective (no HIST course)	4
Area F Technology		
F	Upper-division elective	4
Total units		60

¹ Required in Major; also satisfies GE.

Asian Studies Minor

Required Courses

CHIN 103	Elementary Mandarin Chinese III	4
or JPNS 103	Elementary Japanese III	
HIST 310	East Asian Culture and Civilization	4
or HIST 316	Modern East Asia	
or HIST 319	Modern South and Southeast Asia	
PHIL 320	Asian Philosophy	4
or RELS 301	Religions of Asia	

Approved Electives

(minimum 8 units upper-division) 16

Lower Division:

ANT 201	Cultural Anthropology
CHIN 201	Intermediate Mandarin Chinese I
CHIN 202	Intermediate Mandarin Chinese II
CHIN 203	Intermediate Mandarin Chinese III
ES 244	Survey of Asian American Studies
GEOG 150	Human Geography
HIST 221	World History, Beginnings to 1000
HIST 222	World History, 1000 - 1800
HIST 223	World History, 1800 - Present
JPNS 201	Intermediate Japanese I
LA 211	History of Landscape Architecture: Ancient Civilizations through Colonial America

POLS 225	Introduction to International Relations
----------	---

Upper Division:

ARCH 320	Topics in Architectural History
ART 317	Asian Art Survey
ART 318	Asian Art Topics: National, Religious, and Intellectual Movements
BUS 304	International Supply Chains (Topic: China)
ES 322	Asian American Cultural Images
ES 330	The Chinese American Experience
ES 335	The Filipina/o American Experience
HIST 409	Vietnam War at Home and Abroad
HIST 416	Modern Japan
HIST 417	20th Century China
HIST 418	Chinese Film and History
HIST 419	Modern Southeast Asia
HIST 421	The History of Prostitution
HIST 422	Japanese Postwar Film and History
HIST 423	The History of Vietnam
HIST 443	Topics and Issues in Asian History
POLS 328	Politics of Developing Areas (Topic: East Asia)
POLS 337	U.S. and China in the Contemporary World
POLS 428	Issues and Topics in Comparative Politics (Topic: Chinese Politics)
RELS 306	Hinduism
RELS 307	Buddhism
SOC 350	Social Organization of Modern Japan
WLC 310	Humanities in World Cultures (Topics: China, Japan, Thailand)

Total units 28

History Minor

Required Courses

HIST 303	Research and Writing Seminar in History	5
----------	---	---

Select from the following lower-division courses: 12

HIST 110	Western Civilization: Ancient to Renaissance
HIST 111	Western Civilization: Reformation to the Present
HIST 201	United States History to 1865
HIST 202	United States History Since 1865
HIST 206	American Cultures
HIST 207	Freedom and Equality in American History
HIST 210	World History I
HIST 213	Modern Political Economy
HIST 214	Political Economy of Latin America and the Middle East
HIST 221	World History, Beginnings to 1000

HIST 222	World History, 1000 - 1800	
HIST 223	World History, 1800 - Present	
History Electives		
Select from 300-400 level History courses		12
Total units		29

MA History

Program Learning Objectives

1. Diversity: Construct a self-critical academic perspective on human diversity and social, cultural, political, economic and philosophical traditions.
2. Critical Thinking: Demonstrate skills of historical critical thinking and intellectual discipline: conceptualizing, applying, analyzing, synthesizing, and evaluating materials originating from historical observation, experience, reflection, and reasoning.
3. Knowledge: Demonstrate a breadth and depth of historical knowledge and an understanding of change over time.
4. Historiography: Demonstrate the ability to engage in, interpret, assess, critique, evaluate, and make constructive use of major historiographic debates in various historical fields.
5. Research: Demonstrate the research skills appropriate to a master's-level historian, analyzing and interpreting primary and secondary historical materials from different fields.
6. Communication: Demonstrate the ability to effectively communicate historical knowledge, interpretations, and arguments, in writing and in oral presentations.
7. Engagement: Participate in vibrant intellectual communities, seeking out and respecting others' ideas while working to construct one's own positions and approaches as a historian.
8. Perspective: Construct a broad perspective on the past that enables one to better understand and evaluate the complexities of history and its relevance to one's own time.

There are two options for the MA degree in History, Comprehensive Exam or Thesis.

Required Courses

HIST 504	Graduate Study in History	4
----------	---------------------------	---

History Seminars

Select from the following:		20
Each course is repeatable up to 12 units.		

HIST 505	Graduate Seminar in United States History	
HIST 506	Graduate Seminar in European History	
HIST 507	Graduate Seminar in East Asian History	
HIST 508	Graduate Seminar in Latin American History	
HIST 509	Graduate Seminar in African History	
HIST 510	Graduate Seminar in Comparative History	

History Electives

HIST Electives (400-500 level) ¹		16
---	--	----

Culminating Experience

Select from the following:		8-9
----------------------------	--	-----

Comprehensive Exam Option (total 48 units)		
HIST 512	Supervised Reading for Comprehensive Exams (2) (2)	
HIST Electives (500 level) (4)		
Thesis Option (total 49 units)		
HIST 599	Thesis (3) (3) (3)	
Total units		48-49

- ¹ 400-level courses include extra work for graduate students. (All courses must be taken after undergraduate degree has been awarded. Undergraduate courses or their equivalent may not be repeated.)

Interdisciplinary Studies in the Liberal Arts

Faculty Office Building (Bldg. 47), Room 14
Phone: 805.756.2740
<https://isla.calpoly.edu>
<https://sts.calpoly.edu>

ISLA & STS Director: Elizabeth Lowham

Academic Programs

Program name	Program type
Ethics, Public Policy, Science and Technology	Minor
Gender, Race, Culture, Science and Technology	Minor
Interdisciplinary Studies	BA
Media Arts, Society and Technology	Minor
Science and Risk Communication	Minor

The Program offers interdisciplinary and international classes in a wide variety of subject areas, from applied practice in media arts and technologies; to the study of social, cultural, political, and ethical issues involved in science and technology; to courses that examine world cultures. Many ISLA courses satisfy University general education and breadth requirements.

In addition to the BA Interdisciplinary Studies degree, the program also offers four interdisciplinary Science, Technology and Society (STS) minors: Ethics, Public Policy, Science and Technology; Gender, Race, Culture, Science and Technology; Media Arts, Society and Technology and Science and Risk Communication. These STS minors are available to students throughout the University, regardless of their technical backgrounds.

Undergraduate Programs

BA Interdisciplinary Studies

New program, effective Fall 2018

The BA Interdisciplinary Studies degree provides a flexible, coherent and rigorous baccalaureate education designed around a central theme or guiding question and culminating in an interdisciplinary senior project that draws upon the perspectives or methodologies of at least two disciplines. The program is only open to internal transfer students.

The degree reflects the university's commitment to empower students with a holistic, interdisciplinary experience that prepares them for success in the global economy. The core ISLA courses facilitate students' integration of the multidisciplinary perspectives and knowledges they gain through their other coursework. The culminating senior project draws upon the insights and methodologies gained through students' chosen course of study. This process of honing a guiding question or theme, identifying the methodologies and knowledges necessary to pursue it, and completing an original research or creative project in response to it, develops the habits of mind of a lifelong learner.

The program also reflects the university's commitment to learn by doing, most notably through the senior project, in which students will produce a piece of original interdisciplinary scholarship or a hands-on project that integrates the methods and perspectives of more than one discipline. Students' experiential learning will be further enhanced through the varied opportunities to participate in learn by doing that occurs in classes

throughout the college's curriculum, including through internships and project-based coursework.

Ethics, Public Policy, Science and Technology Minor

The Ethics, Public Policy, Science and Technology (EPPST) minor enables students to understand the complexities of contemporary science and technology policies as they relate to the broader public, ethical theories and applications, and personal and societal values; appreciate the historical influences on existing policies and practices; evaluate current policies; and assess the potential outcomes of proposed policy changes. A broad range of elective courses provides students with the opportunity to customize the EPPST minor to their particular interests, allowing them to pursue further knowledge in a focused subject area—such as biotechnology, sustainability and the environment, genetic engineering, health, development, agriculture, and the technologies of war. Students completing the EPPST minor will gain important skills for creating, proposing, promoting, and evaluating policies that respond to the profound challenges and choices we face related to science and technology in the 21st century at local, national, and international levels. The EPPST minor is not open to students who have declared a minor in one of the other STS minors: Gender, Race, Culture, Science and Technology (GRCST); Media Arts, Society and Technology (MAST); and Science and Risk Communication (SRC).

Gender, Race, Culture, Science and Technology Minor

The Gender, Race, Culture, Science and Technology (GRCST) minor provides students with the opportunity to explore and analyze the historical and contemporary relationships between gender, race, culture, science, technology, and medicine in local, national, and transnational contexts. Utilizing feminist and critical race approaches from the fields of gender and ethnic studies, the GRCST minor examines the role of cultural, ethical, social, political, and economic factors in determining the norms, values and meanings of scientific, technological, and medical practices, with an emphasis on the ways in which the production and applications of science, technology, and medicine shape and are shaped by knowledge and beliefs about gender, race, class, and sexuality. Students completing the GRCST minor will gain important intellectual and practical skills for creating, enacting, and evaluating efforts to create more socially just, equitable, and inclusive science, technology, and medicine in an increasingly diverse and globalized world. The GRCST minor is not open to students who have declared a minor in one of the other STS minors: Ethics, Public Policy, Science and Technology (EPPST); Media Arts, Society and Technology (MAST); and Science and Risk Communication (SRC).

Media Arts, Society and Technology Minor

The Media Arts, Society and Technology (MAST) minor encourages students to explore the ways in which the media arts are enabled and shaped by progress in science and technology while also being uniquely situated to promote engagement with and critical reflection about the meanings of scientific, technical, and social progress. Throughout the MAST minor, students are provided with the opportunity to develop and refine their expertise in the creative, visual, communicative, and performing arts, such as film, video, still photography, sound

design, stage and lighting design, computer graphics, and interactive entertainment. Through hands-on projects and explorations of media history and theory, students completing the MAST minor will develop and apply knowledge and skills in conceptual and critical thinking, media literacy, teamwork, leadership, interdisciplinary collaboration, and project management, and will be prepared to function as both cultural commentators and creators positioned to address and respond to the profound challenges and choices we face in the 21st century. The MAST minor is not open to students who have declared a minor in one of the other STS minors: Ethics, Public Policy, Science and Technology (EPPST); Gender, Race, Culture, Science and Technology (GRCST); and Science and Risk Communication (SRC).

Science and Risk Communication Minor

The Science and Risk Communication (SRC) minor enables students to investigate how individuals and societies create, disseminate, maintain, and challenge perceptions of science, technology, and risk in multiple contexts. The minor focuses on key debates and controversies involving science and technology, public understandings and misunderstandings of scientific and technical expertise, industry-public relations, cultures of regulation and compliance, hazards, uncertainties, crisis management, and the politics of evidence. Through hands-on projects, SRC students will develop and practice specific skills for communicating about science, technology, and risk to various audiences across multiple media formats. A broad range of elective courses allows students to customize the SRC minor to their particular interests, enabling them to pursue knowledge in a focused subject area or further refine communication production skills. Students completing the SRC minor will be prepared to understand, engage with, respond to, and communicate about the profound challenges and choices we face related to science, technology, and risk in the 21st century. The SRC minor is not open to students who have declared a minor in one of the other STS minors: Ethics, Public Policy, Science and Technology (EPPST); Gender, Race, Culture, Science and Technology (GRCST); and Media Arts, Society and Technology (MAST).

BA Interdisciplinary Studies

Program Learning Objectives

1. Identify and think critically about the assumptions, strategies, and potential biases underlying discipline-based and interdisciplinary inquiries.
2. Conduct interdisciplinary research and/or engage in creative activities that incorporate and synthesize information, theory, and methodological approaches from more than one discipline in a culturally-competent way.
3. Apply interdisciplinary approaches to understand, contextualize, and propose solutions to complex issues or problems, especially those relating to students' emphasis areas.
4. Communicate effectively both in writing and orally.
5. Collaborate productively in pluralistic settings and with people of diverse experiences, identities, and worldviews.
6. Make reasoned, ethical, and socially responsible decisions.
7. Engage in self-motivated and self-directed learning, in order to become life-long learners.

8. Employ the intellectual and practical skills necessary to create and engage with a more inclusive, just and equitable world.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (<http://catalog.calpoly.edu/academicstandardsandpolicies/generalrequirementsbachelorsdegree/#generaleducationtext>) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major courses may be taken as credit/no credit.

MAJOR COURSES

Select from the following:		4
ES 112	Race, Culture and Politics in the United States (D1) (USCP) ¹	
ISLA 123	Introduction to Science, Technology & Society	
RELS 201	Religion, Dialogue, and Society (D3) ¹	
WGS 201	Introduction to Women's and Gender Studies in the United States (D1) (USCP) ¹	
COMS 301	Business and Professional Communication	4
or ENGL 310	Corporate Communication	
or ENGL 317	Technical Editing	
Select from the following: ²		4
HIST 213	Modern Political Economy (D2)	
SOC 218	International Political Economy (D2)	
ISLA 201	Introduction to Interdisciplinary Studies	4
ISLA 355	Interdisciplinary Research Methods	4
ISLA 440	Advanced Interdisciplinary Studies Seminar	4
ISLA 461	Senior Project	4
PHIL 335	Social Ethics (C4) (USCP) ²	4
Select from the following:		4
STAT 130	Statistical Reasoning (B1) ¹	
STAT 217	Introduction to Statistical Concepts and Methods (B1) ¹	
STAT 218	Applied Statistics for the Life Sciences (B1) ¹	
STAT 312	Statistical Methods for Engineers	
Approved Electives in Emphasis Area		
Select courses from the Emphasis Areas below. ^{1,2}		32
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		64
FREE ELECTIVES		
Free Electives ¹		48

Some free electives may need to be 300-400 level to ensure completion of the required minimum of 60 units upper division. Consult college advisor for additional information.

Total units 180

¹ If GE courses are used to satisfy Major requirements, additional units of Free Electives may be required to complete the 180 total unit requirement.

² Required in Major; also satisfies GE.

Emphasis Areas

Students select one of the following emphasis areas and choose electives from the courses in that area in consultation with their advisor. To ensure an interdisciplinary course of study, courses chosen should be from at least two different disciplines (as indicated by distinct course prefixes) and no more than half of them can have the same course prefix. Courses chosen also should not have been used to meet other major requirements.

Emphasis Areas

Arts and the Human Experience

ARCH 320	Topics in Architectural History
ART 310	Art History - American Art
ART 311	Art History - Nineteenth Century Art
ART 314	History of Photography
ART 315	Art History - Art Since 1945
ART 317	Asian Art Survey
ART/WGS 316	Women as Subject and Object in Art History
ART 318	Asian Art Topics: National, Religious, and Intellectual Movements
ART 370	Michelangelo
ART 371	Topics in Renaissance Art
COMS 308	Group Performance of Literature
COMS 450	Internship: Communication Studies
DANC 321	Cultural Influence on Dance in America
ES 300	Chicano/a Non-Fiction Literature
ES 310	Hip-Hop, Poetics and Politics
ES 320	African American Cultural Images
ES 321	Native American Cultural Images
ES 322	Asian American Cultural Images
ES 323	Mexican American Cultural Images
ES 326	Native American Architecture and Place
ES 340	Cultural Production and Ethnicity
ISLA 440	Advanced Interdisciplinary Studies Seminar
MU 324	Music and Society
MU 325	America's Music
MU 328	Women in Music
PHIL 350	Aesthetics
TH 305	Topics in Diversity on the American Stage

TH 360	Theatre in the United States
300-level ENGL C4 courses except ENGL 386, ENGL 387, and ENGL 388	
Ethics, Law and Justice	
ES 325	Sexuality and Gender in African American Communities
ES 380	Critical Race Theory
ES 381	The Social Construction of Whiteness
ES/NR 406	Indigenous Peoples and International Law and Policy
ISLA 440	Advanced Interdisciplinary Studies Seminar
JOUR 302	Mass Media Law
JOUR 418	Copyright, Trademark, Patent and Commercial Speech in Digital Media
PHIL 331	Ethics
PHIL 333	Political Philosophy
PHIL 334	Philosophy of Law
PHIL/WGS 336	Feminist Ethics, Gender, Sexuality and Society
POLS 334	Jurisprudence
POLS 341	American Constitutional Law
POLS 342	Constitutional Theory
POLS 343	Civil Rights in America
POLS 344	Civil Liberties
POLS 417	Feminist Legal Theory
POLS 419	Social Movements and Political Protest
POLS 426	International Organizations and Law
POLS 445	Voting Rights and Representation
PSY 375	Forensic Psychology
RELS 378	Religion and Contemporary Values
SOC 402	Crime and Violence
SOC 412	Criminology & Criminal Justice
SOC 406	Juvenile Justice and Delinquency
WGS 467	Women's and Gender Studies Internship
Global Studies	
COMS 316	Intercultural Communication
CRP 334	Cities in a Global World
ES/WGS 351	Gender, Race, Class, Nation in Global Engineering, Technology & International Development
GEOG 308	Global Geography
HIST 309	Cultures of West Africa and the African Diaspora
HIST 310	East Asian Culture and Civilization
HIST 314	Middle East
HIST 316	Modern East Asia
HIST 319	Modern South and Southeast Asia
HIST 335	Modern Europe, 1914-Present
HIST 338	Modern Latin America
HIST 341	Modern Central America

ISLA 315	Critical Issues in Latin American Studies
ISLA 316	London: From Roman Colony to World Capital
ISLA 440	Advanced Interdisciplinary Studies Seminar
JOUR 401	Global Communication
PHIL 320	Asian Philosophy
POLS 321	Comparative Political Culture
POLS 325	Global Political Issues
POLS 339	Authoritarian and Democratic Rule
RELS 301	Religions of Asia
RELS 302	Abrahamic Religions: Judaism, Christianity, and Islam
RELS 304	Judaism
RELS 306	Hinduism
RELS 307	Buddhism
RELS 311	Islam
RELS/POLS 380	Religion and Politics in the Israeli-Palestinian Conflict
TH 390	Global Theatre and Performance
WGS 320	Women, Gender and Sexuality in Global Perspective
WLC 310	Humanities in World Cultures
WLC 451	Latin American Studies Internship
Any 300 or 400-level FR course	
Any 300 or 400-level GER course	
Any 300 or 400-level SPAN course	
Health and Society	
ANT 345	Human Behavioral Ecology
ANT 344	Sex, Death, and Human Nature
ANT 401	Culture and Health
ANT 402	Nutritional Anthropology
BIO 302	Human Genetics
BIO 305	Biology of Cancer
BIO/CHEM 308	Genetic Engineering Technology
COMS 418	Health Communication
ES/WGS 350	Gender, Race, Culture, Science and Technology
ISLA 440	Advanced Interdisciplinary Studies Seminar
PHIL 339	Biomedical Ethics
RELS 372	Spiritual Extremism: Asceticism, Mysticism, and Madness
SOC 326	Sociology of the Life Cycle
SOC/WGS 311	Sociology of Gender
WGS 340	Sexuality Studies
WGS 450	Feminist Theory
WGS 467	Women's and Gender Studies Internship
Any 300 or 400-level PSY courses except PSY 323 and PSY 333	
Science, Technology and Society	
COMS 395	Science Communication

COMS 422	Rhetorics of Science, Technology, and Medicine
COMS 450	Internship: Communication Studies
ES/WGS 350	Gender, Race, Culture, Science and Technology
ES/WGS 351	Gender, Race, Class, Nation in Global Engineering, Technology & International Development
HIST 350	The Scientific Revolution, c. 1500-1800
HIST 354	History of Network Technology
HIST 407	Science and Society in Cold War America
ISLA 303	Values and Technology
ISLA 305	Topics in Public Engagements with STEM
ISLA 440	Advanced Interdisciplinary Studies Seminar
PHIL 321	Philosophy of Science
PHIL 322	Philosophy of Technology
PHIL 323	Ethics, Science and Technology
PHIL 327	Robot Ethics
PHIL 328	Technologies and Ethics of Warfare
PHIL 421	Philosophy of Space, Time and Matter
POLS 451	Technology and Public Policy
RELS 376	Religion, Science and Technology
Social Sustainability	
BRAE 348	Energy for a Sustainable Society
COMS 390	Environmental Communication
ES 360	Ethnicity and the Land
GEOG 301	Geography of Resource Utilization
GEOG 333	Human Impact on the Earth
GEOG 408	Geography of International Development
ISLA 330	Cal Poly Land: Nature, Technology, and Society
ISLA 350	The Global Environment
ISLA 440	Advanced Interdisciplinary Studies Seminar
NR 323	Human Dimensions in Natural Resources Management
NR 324	Social Dimensions of Sustainable Food and Fiber Systems
PHIL 340	Environmental Ethics
POLS 308	Political Violence and Conflict Resolution
POLS 310	The Politics of Race, Class, Gender and Sexuality
POLS 328	Politics of Developing Areas
POLS 333	World Food Systems
POLS 452	Technology and International Development
POLS 459	The Politics of Poverty
PSC 320	Energy, Society and the Environment

PSY 311	Environmental Psychology
PSY 352	Conflict Resolution: Violent and Nonviolent
SOC 301	Social Work and Social Welfare Institutions
SOC 305	Social Movements
SOC 309	The World System and Its Problems
SOC 315	Global Race and Ethnic Relations
SOC 316	American Ethnic Minorities
SOC 323	Social Stratification
SOC 327	Social Change
WGS 467	Women's and Gender Studies Internship

Technology and Human Expression

COMS 317	Technology and Human Communication
COMS 419	Media Effects
COMS 450	Internship: Communication Studies
COMS 485	Cooperative Education Experience
CSC 302	Computers and Society
CSC 311	Computational Art
ENGL 319	Information Design and Production
ENGL 411	New Media Arts I
ENGL 412	New Media Arts II
ENGL 421	Advanced Topics in Technical and Professional Communication
GEOG 318	Applications in GIS
GRC 377	Web and Print Publishing
HIST 354	History of Network Technology
ISLA 340	Media Arts and Technologies: Storytelling
ISLA 341	Media Arts and Technologies: Cinematic Process
ISLA 440	Advanced Interdisciplinary Studies Seminar
JOUR 418	Copyright, Trademark, Patent and Commercial Speech in Digital Media
MU 311	Sound Design: Technologies
MU 312	Sound Design: Recording
WLC 370	Language, Technology and Society

General Education (GE) Requirements

- 72 units required, 8 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics ¹	8
B2	Life Science	4

B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5)	4
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective (4 units in Major) ²	0
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) ¹	4
D2	Political Economy (4 units in Major) ²	0
D3	Comparative Social Institutions ¹	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		64

¹ Requirement may be fulfilled if a student takes a GE course to fulfill a major requirement. If so, the student will need additional units of free electives to complete the total units required for the degree.

² Required in Major; also satisfies GE.

Ethics, Public Policy, Science and Technology Minor

Required Courses

ISLA 123	Introduction to Science, Technology & Society	4
ISLA 303	Values and Technology	4
ISLA 456	Advanced Project-Based Learning in Science, Technology & Society	4

Ethics, Science & Technology Core

Select from the following:		4
PHIL 323	Ethics, Science and Technology	
PHIL 327	Robot Ethics	
PHIL 339	Biomedical Ethics	
PHIL 340	Environmental Ethics	

Public Policy, Science & Technology Core

Select from the following:		4
POLS/UNIV 333	World Food Systems	
POLS 351	Public Policy and Administration	
POLS 451	Technology and Public Policy	
POLS 452	Technology and International Development	
POLS 457	U.S. Reproductive Politics	

EPPST Electives ^{1, 2, 3}

Select from the following:		7-8
AG/ISLA/UNIV 330	Cal Poly Land: Nature, Technology, and Society	

AG/EDES/ENGR/ ISLA/SCM/UNIV 350	The Global Environment
BIO 112	Environmental Biology and Conservation
BIO 227	Wildlife Conservation Biology
BIO 308	Genetic Engineering Technology
BOT 329	Plants, Food, and Biotechnology
BRAE 348	Energy for a Sustainable Society
BUS 311	Managing Technology in the International Legal Environment
COMS 422	Rhetorics of Science, Technology, and Medicine
CRP/NR 404	Environmental Law
CRP/NR 408	Water Resource Law and Policy
CRP 438	Pollution Prevention and Control
CSC 302	Computers and Society
ERSC/GEOG 333	Human Impact on the Earth
ES/WGS 350	Gender, Race, Culture, Science and Technology
ES/NR 406	Indigenous Peoples and International Law and Policy
FSN 319	Food Technology for the Consumer
HIST 407	Science and Society in Cold War America
ISLA 305	Topics in Public Engagements with STEM
KINE 265	Introduction to Community and Public Health
LAES 301	Project-Based Learning in Liberal Arts and Engineering Studies ⁴
LAES 302	Advanced Project-Based Learning in Liberal Arts and Engineering Studies ⁴
LAES 411	Global Synthesis in Liberal Arts and Engineering Studies
MATE 232	Materials, Ethics, and Society
NR 142	Environmental Management
NR 323	Human Dimensions in Natural Resources Management
PHIL 321	Philosophy of Science
PHIL 322	Philosophy of Technology
PHIL 328	Technologies and Ethics of Warfare
POLS 426	International Organizations and Law
PSC 307	Nuclear Weapons in the Post-9/11 World
PSC 320	Energy, Society and the Environment
SCM 320	Technology in London
SCM 335	Nuclear Science and Society
SCM 360	Selected Environmental Issues of California's Central Coast
SCM 451	Ethics in the Sciences
UNIV 391	Appropriate Technology for the World's People: Development

UNIV 392	Appropriate Technology for the World's People: Design
UNIV 424	Design of Museum Displays of Science, Engineering and Technology ⁴
Total units	27-28

- ¹ At least 4 units of EPPST electives must be upper division.
- ² EPPST Elective Courses may also be selected from unused courses in Ethics, Science & Technology or Public Policy, Science & Technology Core or with Minor Advisor approval.
- ³ Please check prerequisites. Your ability to select specific elective courses may vary depending upon your major's curriculum requirements.
- ⁴ Minor Advisor approval required for this course to count as an EPPST elective. Approval is dependent on topics of quarter long projects.

Gender, Race, Culture, Science and Technology Minor

Required Courses 16

ES 112	Race, Culture and Politics in the United States
or WGS 201	Introduction to Women's and Gender Studies in the United States
ES/WGS 350	Gender, Race, Culture, Science and Technology
ISLA 123	Introduction to Science, Technology & Society
ISLA 456	Advanced Project-Based Learning in Science, Technology & Society

Gender, Race, Culture, Science & Technology Core

Select from the following: 4

ANT 393	Action-oriented Ethnography
ANT 401	Culture and Health
ANT 425	Meaning, Gender, and Identity in Anthropological Theory
ANT 460	Queer Anthropology
ES/NR 308	Fire and Society
ES/WGS 351	Gender, Race, Class, Nation in Global Engineering, Technology & International Development
ES/NR 360	Ethnicity and the Land
ES/NR 406	Indigenous Peoples and International Law and Policy
WGS 301	Contemporary Issues in Women's and Gender Studies

Gender, Race, Culture, Science & Technology Electives

Select from the following: ^{2, 3, 4} 8

ANT 360	Human Cultural Adaptations
ANT 402	Nutritional Anthropology
ARCH/ES 326	Native American Architecture and Place
FSN 250	Food and Nutrition: Customs and Culture
GEOG 150	Human Geography

GEOG/ERSC 325	Climate and Humanity	
GEOG 340	Geography of California	
HIST 350	The Scientific Revolution, c. 1500-1800	
HIST 354	History of Network Technology	
ISLA 303/ HNRS 304	Values and Technology	
ISLA/HNRS 320	Topics and Issues in Values, Media and Culture ¹	
JOUR 219	Multicultural Society and the Mass Media	
KINE 255	Personal Health: A Multicultural Approach	
KINE 260	Women's Health Issues	
KINE 265	Introduction to Community and Public Health	
LA 330	Cultural Landscapes: People, Places and Ethical Decisions	
LAES 301	Project-Based Learning in Liberal Arts and Engineering Studies ⁵	
LAES 302	Advanced Project-Based Learning in Liberal Arts and Engineering Studies ⁵	
PHIL 339	Biomedical Ethics	
PHIL 340	Environmental Ethics	
RELS 376	Religion, Science and Technology	
POLS/WGS 457	U.S. Reproductive Politics	
UNIV/HNRS 391	Appropriate Technology for the World's People: Development	
UNIV/HNRS 392	Appropriate Technology for the World's People: Design	
UNIV/HNRS 424	Design of Museum Displays of Science, Engineering and Technology ⁵	
WLC 370	Language, Technology and Society	
Total units		28

¹ Minor Advisor approval required for this course to count as a GRCSST elective. Approval is dependent on subtitle

² GRCSST electives may also be selected from unused Gender, Race, Culture, Science & Technology Core courses or with Minor Advisor approval.

³ Please check prerequisites. Your ability to select specific elective courses may vary depending upon your major's curriculum requirements.

⁴ At least 4 units of GRCSST electives must be upper division.

⁵ Minor Advisor approval required for this course to count as a GRCSST elective. Approval is dependent on topics of quarter long projects.

Media Arts, Society and Technology Minor

Required Courses

8

ISLA 123	Introduction to Science, Technology & Society
----------	---

ISLA 456	Advanced Project-Based Learning in Science, Technology & Society	
Select from the following based on prerequisites associated with MAST Practicum Sequence and Electives:		3-4
ART 101	The Fundamentals of Drawing	
ART 111	Introduction to Art	
ART 112	Survey of Western Art	
ART 122	Basic Digital Photography ¹	
ART 148	Beginning Sculpture	
ISLA 240	Introduction to Media Arts and Technologies	
TH 210	Introduction to Theatre	
TH 227	Theatre History I	
TH 228	Theatre History II	
Media Arts, Society and Technology Practicum Sequence		
Select from the following:		8
ENGL 411 & ENGL 412	New Media Arts I and New Media Arts II	
ISLA 340 & ISLA 341	Media Arts and Technologies: Storytelling and Media Arts and Technologies: Cinematic Process	
Approved Electives		
Select from the following: ^{2, 3, 4}		8
ART 182	Foundation in Digital Art I	
ART 183	Foundation in Digital Art II	
ART 222	Black and White Photography	
ART 288	Interaction Design I	
ART 314	History of Photography	
ART 324	Photographic Expression	
ART 373	New Media Art History	
ART 383	Digital Video I	
ART 388	Interaction Design II	
ART 470	Selected Advanced Topics ⁵	
ART 483	Digital Video II	
ART 484	Animation, Video, and Interactive Design	
ART 489	Advanced Interactive Media Art	
COMS 317	Technology and Human Communication	
COMS 385	Media Criticism	
COMS 419	Media Effects	
CSC 171	Introduction to Interactive Entertainment	
or CSC/CPE 123	Introduction to Computing	
CSC/CPE 471	Introduction to Computer Graphics	
CSC 473	Advanced Rendering Techniques	
CSC/CPE 476	Real-Time 3D Computer Graphics Software	
CSC 478	Current Topics in Computer Graphics	
DANC 340	Dance Composition	
ENGL 370	World Cinema	
ENGL 371	Film Styles and Genres	

ENGL 372	Film Directors
ES 320	African American Cultural Images
ES 321	Native American Cultural Images
ES 322	Asian American Cultural Images
ES 323	Mexican American Cultural Images
ES 340	Cultural Production and Ethnicity
GEOG 318	Applications in GIS
GEOG 328	Applications in Remote Sensing
GEOG 440	Advanced-Applications in GIS
GRC 338	Web Development and Content Management
GRC 339	Web Design and Production
GRC 377	Web and Print Publishing
GRC 429	Digital Media
GRC 452	Emerging Technologies in Graphic Communication
HIST 418	Chinese Film and History
HIST 422	Japanese Postwar Film and History
ISLA 303	Values and Technology
ISLA 320	Topics and Issues in Values, Media and Culture (Pop Culture)
JOUR 219	Multicultural Society and the Mass Media
JOUR 285	Introduction to Multimedia Journalism
JOUR 302	Mass Media Law
JOUR 303	Web Audio and Video
JOUR 346	Broadcast Announcing and Production
JOUR 350	Data Journalism
JOUR 390	Visual Communication for the Mass Media
JOUR 401	Global Communication
JOUR 402	Journalism Ethics
JOUR 410	Advanced Digital Journalism
JOUR 418	Copyright, Trademark, Patent and Commercial Speech in Digital Media
KINE 320	Media and Technology in Health Promotion
LAES 301	Project-Based Learning in Liberal Arts and Engineering Studies ⁵
LAES 302	Advanced Project-Based Learning in Liberal Arts and Engineering Studies ⁵
MU 101 or MU 120	Introduction to Music Theory Music Appreciation
MU 311	Sound Design: Technologies
MU 312	Sound Design: Recording
SPAN 307	Spanish and Latin American Film
TH 230	Stagecraft I
TH 330	Stagecraft II
TH 430	Scenic Design
TH 434	Lighting Design

UNIV 424	Design of Museum Displays of Science, Engineering and Technology ⁵
Total units	27-28

- ¹ Please note that ART 122 is a prerequisite for ART 383 (a MAST elective course option).
- ² MAST Elective Courses may also be selected from unused MAST Practicum courses or with Minor Advisor approval.
- ³ Please check prerequisites. Your ability to select specific elective courses may vary depending upon your major's curriculum requirements.
- ⁴ At least 4 units of MAST electives must be upper division.
- ⁵ Minor Advisor approval is required for this course to count as a MAST elective. Approval is dependent on subtitle or topic.

Science and Risk Communication Minor

ISLA 123	Introduction to Science, Technology & Society	4
ISLA 456	Advanced Project-Based Learning in Science, Technology & Society	4

Science and Risk Communication Core

Select from the following: ¹	8
COMS 390	Environmental Communication
COMS 395	Science Communication
COMS 418	Health Communication
COMS 422	Rhetorics of Science, Technology, and Medicine
ENGL 221	Introduction to Technical and Professional Communication
HIST 354	History of Network Technology
ISLA 305	Topics in Public Engagements with STEM
JOUR 412	Public Relations and Crisis Management

Applied Communication / Media Studies Elective

Select from the following: ¹	4
COMS 385	Media Criticism
COMS 419	Media Effects
ENGL 317	Technical Editing
ENGL 319	Information Design and Production
JOUR 203	News Reporting and Writing
JOUR 205	Agricultural Communications
JOUR 285	Introduction to Multimedia Journalism
JOUR 331	Contemporary Advertising
JOUR 333	Broadcast News
JOUR 342	Public Relations Writing and Editing
JOUR 390	Visual Communication for the Mass Media
UNIV 424	Design of Museum Displays of Science, Engineering and Technology

Science and Risk Communication Electives

Select from the following: ^{1, 2, 3}		6-8
AG/ISLA/UNIV 330	Cal Poly Land: Nature, Technology, and Society	
BIO 308	Genetic Engineering Technology	
BOT 329	Plants, Food, and Biotechnology	
BRAE 348	Energy for a Sustainable Society	
CHEM 349	Chemical and Biological Warfare	
COMS 317	Technology and Human Communication	
CRP 339	Disaster-Resistant Sustainable Communities	
DATA 301	Introduction to Data Science	
ENGL 421	Advanced Topics in Technical and Professional Communication ⁴	
ERSC/GEOG 325	Climate and Humanity	
ERSC/GEOG 333	Human Impact on the Earth	
ES 308	Fire and Society	
ES/WGS 350	Gender, Race, Culture, Science and Technology	
GEOG 301	Geography of Resource Utilization	
HIST 350	The Scientific Revolution, c. 1500-1800	
HIST 359	Living in a Material World	
ISLA 303	Values and Technology	
JOUR 219	Multicultural Society and the Mass Media	
JOUR 303	Web Audio and Video	
JOUR 350	Data Journalism	
JOUR 401	Global Communication	
JOUR 402	Journalism Ethics	
JOUR 413	Public Relations Campaigns	
KINE 298	Disease Epidemiology	
LAES 301	Project-Based Learning in Liberal Arts and Engineering Studies ⁵	
LAES 302	Advanced Project-Based Learning in Liberal Arts and Engineering Studies ⁵	
ME 320	Consumer Energy Guide	
NR 323	Human Dimensions in Natural Resources Management	
NR 351	Introduction to Emergency Management in California	
PHIL 339	Biomedical Ethics	
PHIL 340	Environmental Ethics	
POLS 451	Technology and Public Policy	
PSY 311	Environmental Psychology	
PSY 352	Conflict Resolution: Violent and Nonviolent	
PSY 360	Applied Social Psychology	
SCM 335	Nuclear Science and Society	
SCM 360	Selected Environmental Issues of California's Central Coast	
Total units		26-28

¹ At least half of the units completed for the SRC minor must be upper division (13-14 units).

² Please check prerequisites. Your ability to select specific courses may vary depending upon your major's curriculum requirements.

³ SRC Elective Courses may also be selected from unused Science & Risk Communication Core or the list of electives in Applied Communication / Media Studies or with Minor Advisor approval.

⁴ Minor Advisor approval required for this course to count as an SRC elective. Approval is dependent on subtitle.

⁵ Minor Advisor approval required for this course to count as an SRC elective. Approval is dependent on topics of quarter long projects.

Journalism

Graphic Arts Bldg. (26), Room 228
Phone: 805.756.2508
<https://journalism.calpoly.edu>

Department Chair: Mary Glick

Academic Program

Program name	Program type
Journalism	BS

The Journalism Department offers a professional program leading to the Bachelor of Science degree in Journalism. All majors must complete the basic journalism core courses in addition to a sequence of courses selected from an identified track and a list of electives from which they must choose in consultation with an academic advisor.

Of the 180 units required for a bachelor's degree, 104 quarter units must be taken in courses outside the major area of journalism/media/mass communication. Each student is strongly encouraged to take a modern language to satisfy his or her elective units. For media-related courses offered outside the major, students are required to consult with their academic advisor before enrolling in these classes.

All journalism majors are expected to serve as staff members of the department's student-run media organizations, including digital, print and broadcast editions of Mustang News; public relations firm Central Coast PRspectives; Cal Poly's radio station, KCPR-FM; and program operations of Cal Poly's TV station, CPTV. They are also expected to participate in professional and scholarly organizations in their areas of interest, in addition to applying acquired skills and developing professional abilities in an approved media internship.

Undergraduate Program

BS Journalism

The Journalism Department offers a professional program leading to the Bachelor of Science degree in Journalism. All majors must complete the basic journalism core courses in addition to a sequence of courses selected from an identified track and a list of electives from which they must choose in consultation with an academic advisor.

BS Journalism

Program Learning Objectives

Graduates with a BS in Journalism will:

1. Apply the principles and laws of freedom of speech and of the press.
2. Recognize key events in the history of journalism and mass communication and key principles in the main theories of journalism and mass communication.
3. Demonstrate a broad understanding of how diverse personal, cultural, social, economic, and political factors intersect with the design and delivery of journalism and mass communication.
4. Apply journalism and mass communication concepts and theories in the use and presentation of images and information.
5. Uphold the personal and professional ethics and values of journalism. These include the pursuit of truth, fairness and accuracy.
6. Think critically, creatively and independently.
7. Critically evaluate their own work and that of others to create effective journalism and mass communication messages that are appropriately styled, grammatically correct and relevant to their audiences.
8. Collect and evaluate information to achieve journalism and mass communication goals.
9. Innovate and employ appropriate communication tools and techniques.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: Up to 4 units of credit/no credit grading may be selected for courses in major or support.

MAJOR COURSES

Journalism Core		
JOUR 102	Introduction to Journalism	1
JOUR 203	News Reporting and Writing	4
JOUR/COMS 218	Media, Self and Society (D4) ¹	4
JOUR 285	Introduction to Multimedia Journalism	4
JOUR 302	Mass Media Law	4
JOUR 402	Journalism Ethics	4
JOUR 444	Media Internship	3
JOUR 462	Senior Media Practicum ²	4

Media Technologies

Select from the following:		8
JOUR 303	Web Audio and Video	
JOUR 350	Data Journalism	
JOUR 390	Visual Communication for the Mass Media	
JOUR 403	Multimedia Production for Public Relations and Advertising	
JOUR 410	Advanced Digital Journalism	

Global and Cultural Perspectives

Select from the following:		4
JOUR 219	Multicultural Society and the Mass Media	
JOUR 401	Global Communication	

Select the News Track or the Public Relations Track:		20
--	--	----

News Track

Select 12 units from the following:

JOUR 304	Public Affairs Reporting
JOUR 333	Broadcast News
JOUR 334	Editing
JOUR 346	Broadcast Announcing and Production
JOUR 348	Electronic News Gathering
JOUR 407	Feature Writing
Select 8 units from the following (may be repeated):	
JOUR 352	Advanced Newspaper Reporting Practicum
JOUR 353	Advanced Broadcast Journalism Practicum

Public Relations Track

Select 12 units from the following:

JOUR 304	Public Affairs Reporting
or JOUR 333	Broadcast News
or JOUR 334	Editing
JOUR 312	Public Relations
JOUR 352	Advanced Newspaper Reporting Practicum
or JOUR 353	Advanced Broadcast Journalism Practicum

Select 8 units from the following:

JOUR 342	Public Relations Writing and Editing
JOUR 412	Public Relations and Crisis Management
or JOUR 413	Public Relations Campaigns
JOUR 415	Advanced Public Relations Practice: CCPR

Journalism/ Media/ Mass CommunicationNo more than 16 units of these courses can be applied toward the degree.³ 16

Any JOUR course, including those listed above, if not used to meet major requirements, and:

JOUR 201	Journalism History
JOUR 205	Agricultural Communications
JOUR 220	Introduction to Radio Broadcasting
JOUR 270	Selected Topics
JOUR 320	Cal Poly Radio Laboratory
JOUR 331	Contemporary Advertising
JOUR 400	Special Problems for Advanced Undergraduates
JOUR 418	Copyright, Trademark, Patent and Commercial Speech in Digital Media
JOUR 470	Selected Advanced Topics
JOUR 471	Selected Advanced Laboratory

Media/ Mass Communication courses offered by other departments (see the list below)

Approved Electives

Students are encouraged to pursue minors or develop other areas of interest outside of Journalism, Media, and Mass Communication through Approved Electives and with the following restrictions: 36

At least 24 units must be upper-division courses with a lecture or seminar component. This excludes activity-only, lab-only, or supervision courses such as internships.

No approved electives may be taken in the area of Journalism/Media/Mass Communication. These include media/ mass communication courses offered in other departments. See the Restricted list below.³**SUPPORT COURSES**

STAT 130	Statistical Reasoning (B1) ¹	4
or STAT 217	Introduction to Statistical Concepts and Methods	
or STAT 218	Applied Statistics for the Life Sciences	
or STAT 251	Statistical Inference for Management I	

GENERAL EDUCATION (GE)

(See GE program requirements below.) 64

FREE ELECTIVESFree Electives ⁴ 0

Total units 180

Media/ Mass Communications Courses

No more than 16 units of these courses can be applied toward the degree.

AGC 102	Orientation to Agricultural Communication	2
AGC 200	Special Problems in Agricultural Communication	1-4
AGC 207	Software Applications for Agricultural Publications	2
AGC 270	Selected Topics	1-4
AGC 301	New Media Communication Strategies in Agriculture	4
AGC 339	Internship in Agricultural Communications	1-12
AGC 400	Advanced Special Problems in Agricultural Communication	1-4
AGC 407	Agricultural Publications	4
AGC 426	Presentation Methods in Agricultural Communication	4
ART 288	Interaction Design I	4
ART 383	Digital Video I	4
BUS 453	Digital and New Media Marketing	4
BUS 459	Social Media's Role in Integrated Marketing Communications	4
COMS 317	Technology and Human Communication	4
COMS 385	Media Criticism	4
COMS 419	Media Effects	4
ENGL 317	Technical Editing	4
ENGL 319	Information Design and Production	4
ENGL 411	New Media Arts I	4
ENGL 412	New Media Arts II	4
GRC 101	Introduction to Graphic Communication	3
GRC 338	Web Development and Content Management ⁵	4

GRC 339	Web Design and Production ⁵	4
GRC 377	Web and Print Publishing	4
GRC 420	Graphic Communication in Integrated Marketing Communications ⁵	4
GRC 429	Digital Media ⁵	3
GRC 440	Magazine Design Technology ⁵	4
GRC 452	Emerging Technologies in Graphic Communication ⁵	3
GRC 453	Design Reproduction Topics in Graphic Communication ⁵	3
ISLA 240	Introduction to Media Arts and Technologies	4
ISLA 320	Topics and Issues in Values, Media and Culture	4
ISLA 340	Media Arts and Technologies: Storytelling	4
ISLA 341	Media Arts and Technologies: Cinematic Process	4

¹ Required in Major/Support; also satisfies GE.

² JOUR 460 Senior Project (3 units) combined with one unit of additional JOUR upper division credit, may substitute for JOUR 462 Senior Media Practicum (4 units), with consent of department head.

³ This is particularly relevant to students pursuing minors in Agricultural Communication; Art & Design; Communication Studies; English; Graphic Communication; Integrated Marketing Communications; and Media Arts, Society and Technology.

⁴ If courses meeting GE requirements are used to satisfy Major requirements, additional units of free electives may be needed to satisfy the requirement of 180 units for the degree.

⁵ GRC majors have priority for registration in these highly impacted courses.

C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E) (4 units in Major) ¹	0
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		64

¹ Required in Major/Support; also satisfies GE.

General Education (GE) Requirements

- 72 units required, 8 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (4 units in Support plus 4 units in GE) ¹	4
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5)	4
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4

Music

Davidson Music Center (45), Room 129
 Phone: 805.756.2406; Fax: 805.756.7464
 Email: music@calpoly.edu
<http://www.music.calpoly.edu>

Department Chair: W. Terrence Spiller

Academic Programs

Program name	Program type
Music	BA, Minor

The Bachelor of Arts in Music introduces a student to the role of music in today's world, helps form personal goals, and provides the discipline, skills and knowledge to accomplish those goals. The program develops musical skills, encourages creativity, and cultivates vision for the future. The University's polytechnic emphasis also provides an excellent opportunity to explore music in conjunction with a wide range of other fields. Graduates are prepared to begin specialized study at the graduate level and to enter a wide variety of professional careers.

The Music Department is a valuable resource for the non-music major. Its courses and performing ensembles are open to all students who wish to enrich their lives through music. Qualified students may explore the subject in depth by minoring in music.

The Music Department also serves as a cultural center for both the university and the community through a program of public performances by student and faculty groups and through clinics, workshops, concerts, and lectures by outstanding individuals from outside the university.

Acceptance into the music major program requires a demonstrated ability on an instrument, in voice, or talent through other musical media, plus the ability to read music at a fundamental level.

Undergraduate Programs

BA Music

Designed for the student who wants a broad education in music, the Bachelor of Arts degree offers a balanced program of study in a wide range of subjects. In addition to the traditional emphasis on music theory, history, and performance, Cal Poly's program includes American music, music of non-Western cultures, and the application of sound design. The program provides a large number of elective courses which allows the student to concentrate in a particular area or combine music with other subjects.

Bachelor of Arts Degree Requirements

1. All new students will take placement examinations in piano skills, music theory, and musicianship. Students who audition in person for the major will take the placement exams at the time of their audition. Students who submit a recording with their application will be contacted by the Music Department to schedule the placement exams during the application period. Separate auditions are required for assignment to performing ensembles. Students who wish to take piano, theory, or musicianship courses beyond the beginning level must pass the appropriate placement test. Regardless of courses taken prior to coming to Cal Poly, students are required to remedy deficiencies before enrolling in advanced music theory or music history courses.

2. Each music major must be enrolled in at least 6 units of music courses each quarter, including a performance ensemble and lessons, until curricular requirements are met. (See the Department for details regarding appropriate ensembles and applied study policies.) Each student enrolled in private instruction must take an applied music jury at the end of Spring Quarter.
3. Each student is required to attend a minimum of 6 concerts per quarter.
4. At the end of the sixth quarter of enrollment a student must take a mid-point evaluation to verify progress and potential in music. External transfer students must take the theory and musicianship portions of the mid-point evaluation at the beginning of their first quarter of enrollment; they must take performance skills (jury) and piano proficiency exams by the end of their third quarter of enrollment. The testing timetable for internal transfers will be established on a case-by-case basis. The mid-point evaluation includes the following:
 - a. individual performance skills (should be at the MU 250 level; tested through a jury)
 - b. musicianship skills up through the level of Musicianship III
 - c. knowledge of music theory up through the level of Theory II
 - d. piano proficiency (see No. 5 below)
5. Each student must pass examinations in six areas of piano proficiency (repertoire, sightreading, transposition, harmonization of a melody, accompanying, score-reading) as part of the mid-point evaluation.
6. Use of Music Department instruments, scheduled practice rooms, electronic studio, or lockers requires a Music Use Fee. See the Music Department Office for details.
7. It is important that each student stay closely in touch with his/her advisor in order to progress through the music major program in the most efficient manner.
8. The Music Department is not able to offer the full complement of performing ensembles and private instruction during the Summer Quarter; it is important to take this into consideration when planning coursework for completion of the major.

A music major handbook giving complete details of the program, policies, and forms is available from the Music Department.

Music Minor

A minor is available to students who desire documented competency in music. An individualized curriculum (incorporating theory, history, and performance) based on the following guidelines is developed in consultation with a member of the music faculty. Students must complete one academic music lecture course at Cal Poly, such as MU 101 or MU 120, before applying for the minor. Information and application forms for the declaration of a Music minor are available in the Music Department Office, as well as online at www.music.calpoly.edu.

BA Music

Program Learning Objectives

1. Understand the role of music in today's world
2. Understand the applications of technology to musical activities
3. Form personal goals in the field of music and complete a capstone project related to those goals

4. Demonstrate understanding of music theory
5. Demonstrate understanding of music history
6. Demonstrate competence in musical performance
7. Demonstrate competence in musicianship skills
8. Communicate effectively

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

MU 103	Music Theory I: Diatonic Materials	4
MU 104	Musicianship I	2
MU 105	Music Theory II: Chromatic Materials	4
MU 106	Musicianship II	2
MU 108	Musicianship III	2
MU 121	Introduction to Non-Western Musics	4
MU 303	Music Theory III: Advanced Chromaticism	4
MU 305	Music Theory IV: Contemporary Practices	4
MU 311	Sound Design: Technologies	4
MU 320	Music Research and Writing	4
MU 325	America's Music (USCP)	4
or MU 326	Cultural Concepts and Structures in Music	
or MU 336	Jazz History and Theory	
or MU 470	Music History: Selected Advanced Topics	
MU 331	Music of the Middle Ages and Renaissance	4
MU 332	Music of the Baroque and Early Classic Eras	4
MU 431	Music of the Classic and Romantic Eras	4
MU 432	Music of the Modern Era	4
MU 461	Senior Project	3
Approved music lecture courses (300-400 level) ¹		
Select from the following:		12
MU 301	Counterpoint	
MU 312	Sound Design: Recording	
MU 324	Music and Society	
MU 325	America's Music	
MU 326	Cultural Concepts and Structures in Music	
MU 328	Women in Music	
MU 336	Jazz History and Theory	
MU 340	Conducting: Fundamentals	
MU 341	Conducting: Choral	

MU 342	Conducting: Instrumental
MU 352	Orchestration
MU 360	Music for Classroom Teachers
MU 411	Sound Design: Synthesis
MU 412	Sound Design: Composition and Production
MU 465	Choral Literature and Rehearsal Techniques
MU 466	Instrumental Literature and Rehearsal Techniques
MU 470	Music History: Selected Advanced Topics

Major Ensemble 100-level

Select from the following:		6
MU 168	Piano Accompanying	
MU 170	University Jazz Band	
MU 171	Instrumental Ensembles	
MU 172	Wind Orchestra	
MU 173	Wind Ensemble	
MU 174	Symphony Orchestra	
MU 177	Chamber Winds	
MU 181	Polyphonics	
MU 183	Vocal Ensemble	
MU 185	University Singers	
MU 186	Early Music Ensemble	
MU 188	Arab Music Ensemble	

Major Ensemble at 300-level

Select from the following:		3
MU 368	Piano Accompanying	
MU 370	University Jazz Band	
MU 371	Instrumental Ensemble	
MU 372	Wind Orchestra	
MU 373	Wind Ensemble	
MU 374	Symphony Orchestra	
MU 377	Chamber Winds	
MU 381	Polyphonics	
MU 383	Vocal Ensemble	
MU 385	University Singers	
MU 386	Early Music Ensemble	
MU 388	Arab Music Ensemble	

Applied Study

Select from the following:		9
MU 150	Applied Music	
MU 250	Applied Music	
MU 350	Applied Music	
MU 450	Applied Music	

GENERAL EDUCATION (GE)

(See GE program requirements below.) 72

FREE ELECTIVES

Free Electives	21
Total units	180

¹ MU 325, MU 326, MU 336, MU 470 can satisfy this requirement if not previously used to satisfy another required music course.

General Education (GE) Requirements

- 72 units required.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics	8
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5)	4
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective (no MU course)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		72

Music Minor

Required Courses

Select from the following music theory courses: 4

MU 101 Introduction to Music Theory

MU 103 Music Theory I: Diatonic Materials

Select from the following music theory or music history courses: 4

Theory Courses

MU 103 Music Theory I: Diatonic Materials

MU 105 Music Theory II: Chromatic Materials

MU 114 Introduction to Composing

History Courses

MU 120 Music Appreciation

MU 121 Introduction to Non-Western Musics

MU 221 Jazz Styles

MU 227 Popular Music of the USA

MU 229 Music of the 60's: War and Peace

Select from the following theory or history or performance courses: 4

Theory Courses

MU 105 Music Theory II: Chromatic Materials

MU 114 Introduction to Composing

History Courses

MU 120 Music Appreciation

MU 121 Introduction to Non-Western Musics

MU 221 Jazz Styles

MU 227 Popular Music of the USA

MU 229 Music of the 60's: War and Peace

Performance Courses

Musicianship

MU 104 Musicianship I

MU 106 Musicianship II

MU 108 Musicianship III

Beginning Jazz Improvisation

MU 259 Beginning Jazz Improvisation

Class Voice

MU 154 Beginning Voice

Class Piano

MU 151 Beginning Class Piano

MU 152 Elementary Class Piano

MU 253 Advanced Class Piano

Class Guitar

MU 155 Beginning Guitar

Any lower-division ensemble

MU 168 Piano Accompanying

MU 170 University Jazz Band

MU 171 Instrumental Ensembles

MU 172 Wind Orchestra

MU 173 Wind Ensemble

MU 174 Symphony Orchestra

MU 176 Mustang Band

MU 177 Chamber Winds

MU 178 Field Show Marching Skills

MU 181 Polyphonics

MU 183 Vocal Ensemble

MU 185 University Singers

MU 186 Early Music Ensemble

MU 188 Arab Music Ensemble

Upper Division Electives

Electives: 12

Choose from 300-400 level Music course, with the following stipulations:

1) If NO lower-division units were in history, then at least 4 units must be in an upper-division history course (MU 324, MU 325, MU 328)

2) In the area of performance, there is a required minimum of 2 units, either lower or upper-division; the maximum number of performance units that can be applied to the minor is 8, with no more than 4 units at each level.

3) No more than 2 units in the minor may be satisfied by MU 400

4) No more than 4 units in the minor may be satisfied by the following upper-division performance courses:
MU 368, MU 370, MU 371, MU 372, MU 373, MU 374,
MU 376, MU 377, MU 378, MU 381, MU 383, MU 385,
MU 386, MU 388, MU 389

Total units

24

Philosophy

Faculty Office Bldg. (47), Room 37

Phone: 805.756.2041

<https://philosophy.calpoly.edu>

Department Chair: Kenneth Brown

Academic Programs

Program name	Program type
Philosophy	BA, Minor
Religious Studies	Minor

The Philosophy Department at Cal Poly is one of the largest in the CSU system. It prides itself on excellence in teaching and the high standards met by its students. A degree in philosophy is one of the best preparations for graduate or professional school and the evidence for this is substantial. Nationally, philosophy majors outscore everyone but majors in mathematics and physics on the Law School Admissions Test (LSAT). Similar trends are also seen for scores in all sections of the Graduate Record Exam (GRE) and on the Graduate Management Admission Test (GMAT), the exam required by most MBA programs.

The reason for this is unsurprising. The study of philosophy requires the meticulous development of general analytical reasoning skills. Even students not planning to go on to graduate or professional school are well served by the analytical and verbal skills developed by the study of philosophy. The ability to communicate clearly and forcefully is increasingly rare and, as a result, increasingly sought after in the job market.

Undergraduate Programs

BA Philosophy

Students can pursue a curriculum leading to a Bachelor of Arts degree in Philosophy, including an optional concentration in Ethics and Society, and a curriculum leading to a minor in Philosophy. The department also offers courses and a minor in Religious Studies. An unusually large number of courses is offered in the history of philosophy, as well as courses in specific areas of philosophy (logic, ethics, metaphysics, epistemology), and courses that deal with the philosophical issues arising in other disciplines (e.g., philosophy of art and philosophy of science).

Concentrations

Students may choose to complete 20 units of 300-400 level philosophy courses *or* the concentration.

Ethics and Society

Designed for students with an interest in pursuing professional careers in which they will need to address practical ethical issues, especially careers in business, medicine, politics and law.

Philosophy Minor

The minor program in Philosophy is designed for students who want to add to their education an understanding of the history of philosophy, of contemporary trends in philosophy, and of philosophical issues relevant to their major field of study. Interested students are invited to contact

the Philosophy Department Office or website for more information and application forms.

Religious Studies Minor

The Religious Studies minor program is designed for students who want to enhance their understanding of the great religious traditions of the contemporary world and some of the social issues involving these religions. The minor consists of 24 units. Interested students are invited to contact the Philosophy Department Office for more information and application forms.

BA Philosophy

Program Learning Objectives

1. Significant critical skill
2. Sound command of logic
3. Competence at philosophical writing
4. Good, general knowledge of the history of philosophy
5. Grasp of main currents in contemporary philosophy
6. Familiarity with methods of contemporary philosophical inquiry

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

PHIL 101	Introduction to Philosophy	4
PHIL 230	Philosophical Classics: Knowledge and Reality (C2) ¹	4
PHIL 231	Philosophical Classics: Ethics and Political Philosophy	4
PHIL 241	Symbolic Logic	4
PHIL 321	Philosophy of Science	4
PHIL 331	Ethics	4
PHIL 411	Metaphysics	4
PHIL 412	Epistemology	4
PHIL 460	Senior Project I	2
PHIL 461	Senior Project II	2

History of Philosophy electives

Select from the following: 4

PHIL 309	Early Greek Philosophy through Plato
PHIL 310	Aristotle and Hellenistic Philosophy
PHIL 312	Medieval Philosophy

Select from the following: 4

PHIL 313	Early Modern Rationalism
PHIL 314	Early Modern Empiricism

PHIL 315	Kant and 19th Century European Philosophy	
Select from the following:		4
PHIL 317	History of Analytic Philosophy	
PHIL 318	Phenomenology	
PHIL 319	Existentialism	
Select from History of Philosophy electives listed above		4
Concentration (see below) or 20 units of PHIL electives ²		20
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		68
FREE ELECTIVES		
Free Electives		40
Total units		180

¹ Required in Major; also satisfies GE

² At least 12 units of the 20 must be 400-level if the PHIL electives option is chosen rather than the concentration.

Concentration or Electives

Select either the following concentration or 20 units of 300-400 level PHIL electives, of which at least 12 units must be 400 level.

- Ethics and Society (p. 302)

General Education (GE) Requirements

- 72 units required, 4 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics	8
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5)	4
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy (4 units in Major) ¹	0
C3	Fine/Performing Arts	4
C4	Upper-division elective (no PHIL course)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4

D5	Upper-division elective (no PHIL course)	4
Area F	Technology	
F	Upper-division elective	4
Total units		68

¹ Required in Major; also satisfies GE

Ethics and Society Concentration

Select from the following:		20
PHIL 285	Ethics Bowl	
PHIL 322	Philosophy of Technology	
PHIL 323	Ethics, Science and Technology	
PHIL 327	Robot Ethics	
PHIL 328	Technologies and Ethics of Warfare	
PHIL 332	History of Ethics	
PHIL 333	Political Philosophy	
PHIL 334	Philosophy of Law	
PHIL 335	Social Ethics (USCP)	
PHIL 336	Feminist Ethics, Gender, Sexuality and Society (USCP)	
PHIL 337	Business Ethics	
PHIL 339	Biomedical Ethics	
PHIL 340	Environmental Ethics	
PHIL 341	Professional Ethics	
PHIL 343	Continental Political Philosophy	
PHIL 385	Advanced Ethics Bowl (up to 4 units)	
PHIL 439	Selected Problems in Ethics and Political Philosophy	
Total units		20

Philosophy Minor

Required Course

PHIL 230	Philosophical Classics: Knowledge and Reality	4
or PHIL 231	Philosophical Classics: Ethics and Political Philosophy	

Approved Electives

Select from the following:		4
PHIL 309	Early Greek Philosophy through Plato	
PHIL 310	Aristotle and Hellenistic Philosophy	
PHIL 313	Early Modern Rationalism	
PHIL 314	Early Modern Empiricism	
PHIL 315	Kant and 19th Century European Philosophy	
Select from the following:		4
PHIL 321	Philosophy of Science	
PHIL 331	Ethics	
PHIL 411	Metaphysics	
PHIL 412	Epistemology	
Additional PHIL Electives (at least 4 units at the 400 level)		12
Total units		24

Religious Studies Minor

Required Courses

Area A: History of World Religious Traditions

Select from the following: 8

ENGL 354	The Bible as Literature and in Literature and the Arts
HIST 452	Renaissance and Reformation Europe
RELS 205	Jesus
RELS 301	Religions of Asia
RELS 302	Abrahamic Religions: Judaism, Christianity, and Islam
RELS 304	Judaism
RELS 306	Hinduism
RELS 307	Buddhism
RELS 310	Christianity
RELS 311	Islam

Area B: Method and Theory in the Study of Religion

Select from the following: 4

PHIL 320	Asian Philosophy
PHIL 342	Philosophy of Religion
RELS 344	Approaches to Religion and Spirituality
SOC 377	Sociology of Religion

Area C: Issues and Themes in the Contemporary Study of Religion

Select from the following: 4

ART 318	Asian Art Topics: National, Religious, and Intellectual Movements
HIST 306	The Witch-Hunts in Europe, 1400-1800
HIST 453	Religious Wars and Absolutism
RELS 201	Religion, Dialogue, and Society
RELS/WGS 370	Religion, Gender, and Society
RELS 372	Spiritual Extremism: Asceticism, Mysticism, and Madness
RELS 374	Religion and Violence
RELS 376	Religion, Science and Technology
RELS 378	Religion and Contemporary Values
RELS/POLS 380	Religion and Politics in the Israeli-Palestinian Conflict
RELS 400	Special Problems for Advanced Undergraduates
RELS 470	Selected Advanced Topics

Approved Electives (any additional RELS course) 8

Total units 24

Political Science

Faculty Office Bldg. (47), Room 14-A

Phone: 805.756.2984

<https://politicalscience.calpoly.edu/>

Department Chair: Elizabeth Lowham

Academic Programs

Program name	Program type
Global Politics	Minor
Law and Society	Minor
Political Science	Minor, BA
Public Policy	MPP

The Political Science Department offers instruction leading to a Bachelor of Arts degree in Political Science and a Master of Public Policy degree. Through the required and elective courses, the department prepares students to become informed, active citizens. Undergraduate and graduate programs emphasize the comprehension of political thinking and the application of communication and analytical skills, and prepare students for careers in research and survey analysis, administration, teaching, business, graduate studies, or leadership positions in the public, private, and nonprofit sectors.

In addition to the undergraduate major and the graduate program, the department offers minors in Political Science, Global Politics and Law and Society. General Education courses in the department expose students to political thought, the fundamentals of U.S. politics, global issues, and the politics of foreign countries. The department supports internship opportunities in local, state, and federal agencies in federal agencies, applied public policy research, law, and non-profit agencies.

Undergraduate Programs

BA Political Science

The major provides students with insights into the behavior of countries, individuals, and groups as they pursue their political and economic interests. Students considering work in related fields such as law, education, administration, government, and business gain basic knowledge of principles and practices in those areas. Additionally, students who are planning graduate work can establish a sound foundation for advanced studies in political science, law, public administration, business administration, urban planning, and other related fields.

Concentrations

American Politics

Study of American governmental institutions, campaigns and elections, parties, public policy, and social movements. Provides students with a broad knowledge of the American political system that can prepare them for careers in government employment at the local, state, or national level, campaign advising, policy analysis, urban and regional planning, or leadership positions in advocacy groups.

Global Politics

Study of international and comparative politics, politics of developing areas, and U.S. foreign policy. Prepares students for careers in the diplomatic corps, foreign policy analysis, transnational nongovernmental organizations, intelligence analysis, or international business.

Pre-Law

Study of American constitutional law, civil liberties, civil rights, jurisprudence and judicial process. Prepares students for careers in law. Some students may apply to law school to continue their preparation for the legal profession. Others may seek careers in law-related professions such as law enforcement, judicial administration and legal assistance.

Individualized Course of Study

As an alternative option to one of the concentrations, students may pursue a course of study that meets their individual needs and interests.

Global Politics Minor

The minor consists of required coursework and approved electives.

Details are available from the Political Science Department. Minor is not open to POLS majors in the Global Politics concentration.

Law and Society Minor

The minor consists of required coursework and approved electives.

Details are available from the Political Science Department. Minor is not open to POLS majors in the Pre-Law concentration.

Political Science Minor

The minor consists of required coursework and approved electives.

Details are available from the Political Science Department.

Master of Public Policy

General Characteristics

The Master of Public Policy degree program (MPP) is professionally oriented, and open to students who wish to pursue analytic careers in government, nonprofit organizations, consulting, advocacy and related policy occupations. The program is structured to prepare graduates with competence and creativity to excel in careers in the ever-changing world of public policy. The core courses cover public policy, public policy analysis, economic and regulatory policy, research design, quantitative methods, leadership, policy internships, and graduate seminar.

The MPP program is designed to meet the needs of those who have earned baccalaureate degrees in a variety of disciplines, including, but not limited to, economics, history, political science, social sciences, psychology, city and regional planning, business administration, education, environmental studies, and natural resource management.

The program is two years in duration for students taking 8 or more units per term. It consists of 60 approved units (not including courses necessary to compensate for deficiencies). Because of the sequencing of courses, students admitted to the program are expected to begin study in the fall quarter. In their second year, students undertake the development, presentation, and discussion of individual research projects in a two-term seminar (POLS 590). After the completion of POLS 590, students are required to pass a comprehensive exam. The program offers students opportunities to develop close working relationships with faculty. Self-directed study, tailored to student interest and needs, is encouraged.

Prerequisites

Students entering the program are expected to bring with them backgrounds in certain basic subject areas or to make up deficiencies in these areas after admission. These include the following Cal Poly

course or its equivalent: STAT 217 Introduction to Statistical Concepts and Methods.

Admission Requirements

1. Possession of a baccalaureate degree from an accredited college or university;
2. A grade point average of not less than 3.00 in all undergraduate coursework;
3. Related undergraduate coursework or work experience;
4. The quality of previous educational and professional experiences measured by:
 - a. Biographical and career data (resumes, examples of reports, letters of recommendation, etc.),
 - b. Professional training in fields such as budgeting, management, and supervision in the public, health, or nonprofit sectors, and
 - c. A personal statement describing a student's experience and reasons for applying to the program
 - d. GRE scores are recommended, but not required, for admission.
5. For applicants whose preparatory education is principally in a language other than English, a TOEFL score of 550 or higher (or 213 on the new conversation scale for the computer-based TOEFL exam).

Program of Study

Graduate students must file a formal study plan with their major professor, graduate committee, department, college and university graduate studies office no later than the end of the quarter in which the twelfth unit of approved courses is completed. The formal program of study must include a minimum of 60 units. All courses on the formal study plan must be taken on a graded basis unless specified in the course catalog as credit/no credit (CR/NC).

BA Political Science

Program Learning Objectives

1. Subject Matter Expertise: Through their curricular and co-curricular work, students will demonstrate expertise in political science and its subfields, as well as its relationship to the broader worlds of study and practice.
2. Critical Thinking: Students will demonstrate critical thinking through their coursework and/or co-curricular activities.
3. Working Productively and Communicating Effectively: Through their coursework and/or co-curricular activities, students will demonstrate their ability to work productively, both alone and in groups, their knowledge of the principles of effective communication, and their ability to communicate the results of their work effectively through a variety of tools and techniques.
4. Ethics, Diversity and Sustainability: In the context of coursework and/or co-curricular activities, students will demonstrate that they have the knowledge and skills necessary to make reasoned decisions, and that they can bring an understanding of the politics surrounding and the value of ethics, diversity and sustainability to bear on those decisions.
5. Lifelong Learning and Positive Contribution: Through their coursework and/or co-curricular activities, students will demonstrate that they have the knowledge and skills to engage in lifelong learning aimed at making a positive contribution to society.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

POLS 112	American and California Government (D1) ¹	4
POLS 180	Political Inquiry	4
POLS 225	Introduction to International Relations	4
POLS 229	Introduction to Comparative Politics	4
POLS 230	Basic Concepts of Political Thought	4
POLS 359	Research Design	4
POLS 361	Quantitative Methodology	4
POLS 461 & POLS 462	Senior Project I and Senior Project II	4
Political Science electives (300-400 level) ²		20
Concentration courses or individualized course of study		28

Support Courses

Select from the following:		4
ANT 201	Cultural Anthropology	
GEOG 150	Human Geography	
HIST 110	Western Civilization: Ancient to Renaissance	
HIST 111	Western Civilization: Reformation to the Present	
HIST 222	World History, 1000 - 1800	
HIST 223	World History, 1800 - Present	
STAT 217	Introduction to Statistical Concepts and Methods (B1) ¹	4

GENERAL EDUCATION (GE)

(See GE program requirements below.)	64
--------------------------------------	----

FREE ELECTIVES

Free Electives	28
Total units	180

¹ Required in Major/Support; also satisfies GE.

² A total of 4 units of either POLS 386 or POLS 387 may count toward upper division Political Science electives. A total of 4 units of either POLS 386 or 387 may count towards the concentration. A total of 4 units of either POLS 386 or POLS 387 may count toward Free Electives. Any combination of POLS 386 and POLS 387 may be taken for a maximum of 12 units total credit for the degree.

Concentrations or Individualized Course of Study (select one)

- American Politics (p. 306)
- Global Politics (p. 306)
- Pre-Law (p. 307)

Individualized Course of Study

A minimum of 28 units of coursework are selected by the student and approved by the student's academic advisor. 20 of these must be at the 300–400 level and 16 units must carry a POLS prefix.

General Education (GE) Requirements

- 72 units required, 8 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (4 units in Support plus 4 units in GE) ¹	4
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5)	4
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement) (4 units in Major) ¹	0
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective (no POLS course)	4
Area F	Technology	
F	Upper-division elective	4
Total units		64

¹ Required in Support; also satisfies GE

American Politics Concentration

Select from the following: 8

POLS 315	The American Presidency	
----------	-------------------------	--

POLS 319	United States Congress	
POLS 341	American Constitutional Law	
POLS 342	Constitutional Theory	
POLS 348	Early American Political Thought	
POLS 349	Contemporary American Political Thought	
Select from the following:		8
POLS 310	The Politics of Race, Class, Gender and Sexuality	
POLS 316	Political Participation	
POLS 317	Campaigns and Elections	
POLS 419	Social Movements and Political Protest	
POLS 445	Voting Rights and Representation	
POLS 457	U.S. Reproductive Politics	
POLS 459	The Politics of Poverty	
Select from the following:		8
POLS 351	Public Policy and Administration	
POLS 375	California Politics	
POLS 386	Government Internship ¹	
POLS 387	Research Internship ¹	
POLS 440	California Student Bill Project	
POLS 431	Issues and Topics in American Politics	
POLS 451	Technology and Public Policy	
POLS 470	Selected Advanced Topics	
POLS 471	Urban Politics	
Approved Electives		
Select from the following: ²		4
Any unused course in this concentration ¹		
Total units		28

¹ A total of 4 units of either POLS 386 or POLS 387 may count toward concentration requirements.

² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Global Politics Concentration

POLS 308	Political Violence and Conflict Resolution	4
or POLS 381	Peace and War	
POLS 321	Comparative Political Culture	4
or POLS 426	International Organizations and Law	
or POLS 427	Politics of the Global Economy	
POLS 328	Politics of Developing Areas	4
or POLS 383	Politics of the European Union	
POLS 382	Comparative Foreign Policy	4
or POLS 420	Contemporary U.S. Foreign Policy	
POLS 428	Issues and Topics in Comparative Politics	4
or POLS 429	Issues and Topics in International Relations	

Approved Electives

Select from the following: ¹

8

POLS 285	Model United Nations
POLS 324	International Relations Theory
POLS 325	Global Political Issues
POLS 333	World Food Systems
POLS 339	Authoritarian and Democratic Rule
POLS/RELS 380	Religion and Politics in the Israeli-Palestinian Conflict
POLS 384	Comparative Law
POLS 386	Government Internship ²
POLS 387	Research Internship ²
POLS 425	Comparative Political Corruption
POLS 435	Political Communication
POLS 451	Technology and Public Policy
POLS 452	Technology and International Development
Any unused course in this concentration	

Total units 28

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² A total of 4 units of either POLS 386 or POLS 387 may count toward concentration requirements.

Pre-Law Concentration

POLS 245	Judicial Process	4
POLS 334	Jurisprudence	4
POLS 341	American Constitutional Law	4
POLS 343	Civil Rights in America	4
POLS 344	Civil Liberties	4

Approved electives

Select from the following: ¹

8

BUS 207	Legal Responsibilities of Business
BUS 409	Law of Real Property
BUS 410	The Legal Environment of International Business
BUS 473	Employment Law
CRP/NR 404	Environmental Law
ES 380	Critical Race Theory
JOUR 302	Mass Media Law
LS 214	Constitutional Issues in the History of U.S. and California Education
PHIL 334	Philosophy of Law
POLS 295	Foundations of Mock Trial
POLS 340	American Judicial Politics
POLS 342	Constitutional Theory
POLS 384	Comparative Law
POLS 386	Government Internship ²
POLS 387	Research Internship ²
POLS 417	Feminist Legal Theory
POLS 426	International Organizations and Law
POLS 445	Voting Rights and Representation

POLS 457	U.S. Reproductive Politics
PSY 375	Forensic Psychology
SOC 402	Crime and Violence
SOC 406	Juvenile Justice and Delinquency
SOC 412	Criminology & Criminal Justice

Total units 28

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² A total of 4 units of either POLS 386 or POLS 387 may count toward concentration requirements.

Global Politics Minor

Required Courses

POLS 225	Introduction to International Relations	4
POLS 229	Introduction to Comparative Politics	4
Select from the following:		16

POLS 308	Political Violence and Conflict Resolution
POLS 321	Comparative Political Culture
POLS 328	Politics of Developing Areas
POLS 380	Religion and Politics in the Israeli-Palestinian Conflict
POLS 381	Peace and War
POLS 382	Comparative Foreign Policy
POLS 383	Politics of the European Union
POLS 384	Comparative Law
POLS 425	Comparative Political Corruption
POLS 426	International Organizations and Law
POLS 427	Politics of the Global Economy
POLS 428	Issues and Topics in Comparative Politics
POLS 429	Issues and Topics in International Relations
POLS 451	Technology and Public Policy
POLS 452	Technology and International Development

Approved Electives

Electives	4
Total units	28

Law and Society Minor

Required Courses

POLS 245	Judicial Process	4
POLS 341	American Constitutional Law	4
Select from the following:		8

POLS 334	Jurisprudence
POLS 343	Civil Rights in America
POLS 344	Civil Liberties

Approved Electives ¹

Select from the following: 11-12

CRP/NR 404	Environmental Law	
ES 380	Critical Race Theory	
JOUR 302	Mass Media Law	
LS 214	Constitutional Issues in the History of U.S. and California Education	
PHIL 334	Philosophy of Law	
POLS 295	Foundations of Mock Trial	
POLS 340	American Judicial Politics	
POLS 342	Constitutional Theory	
POLS 384	Comparative Law	
POLS 386	Government Internship (4 units maximum)	
POLS 387	Research Internship (4 unit maximum)	
POLS 417	Feminist Legal Theory	
POLS 426	International Organizations and Law	
POLS 445	Voting Rights and Representation	
POLS 457	U.S. Reproductive Politics	
PSY 375	Forensic Psychology	
SOC 402	Crime and Violence	
SOC 406	Juvenile Justice and Delinquency	
SOC 412	Criminology & Criminal Justice	
Total units		27-28

¹ POLS majors must take at least one Approved Elective with a non-POLS prefix.

Political Science Minor

Required Courses

Select from the following:	12
POLS 112	American and California Government
POLS 225	Introduction to International Relations
POLS 229	Introduction to Comparative Politics
POLS 230	Basic Concepts of Political Thought

Approved Electives

Select from the following:	16
Any 300-400 level POLS courses	
Total units	28

particular substantive area and the social, political, economic, and technological context in which it exists.

- MPP students will develop leadership capacities that will prepare them to work productively as individuals and in groups.
- MPP students will develop tools that prepare them to participate constructively in the process of creating, implementing and evaluating public policy.
- MPP students will learn to recognize and reconcile diverse perspectives, and the tradeoffs they entail, in pursuit of the public interest.
- MPP students will utilize internship experiences and course knowledge to prepare them for dynamic and professional careers in the ever-changing field of public policy.

Required Courses

POLS 510	Research Design	4
POLS 515	Public Policy	4
POLS 518	Public Policy Analysis	5
POLS 540	Leadership and Management in Public Policy	4
POLS 550	Regulatory and Economic Policy	4
POLS 560	Quantitative Methods	5
POLS 586	Policy Internship	4-8
POLS 590	Graduate Seminar	8
POLS 595	Directed Readings for MPP Comprehensive Exams	2

Approved Electives

Additional 400 and 500-level courses, to be selected with graduate advisor's approval. 16-20

At least 4 units must be at the 500 level.

Total units	60
-------------	----

Master of Public Policy

Program Learning Objectives

- MPP students will be able to think critically and creatively about public policy theory, analysis and application. In particular, students will develop knowledge and skills in quantitative and qualitative analysis, argumentation, and the process and practice of research in general and as applied to a substantive policy area.
- MPP students will develop skills for the clear, concise, and effective communication of ideas. This includes the communication of evidence, analysis, and arguments via written, visual, and oral methods.
- MPP students will demonstrate expertise in the field of public policy, including an appreciation of the connections between a

Psychology and Child Development

Faculty Office Bldg. (47), Room 24

Phone: 805.756.2033

<https://psyecd.calpoly.edu>

Department Chair: Jasna Jovanovic

Academic Programs

Program name	Program type
Child Development	BS, Minor
Gerontology	Minor
Psychology	BS, MS, Minor

The department consists of faculty with degrees in psychology, family studies, human development and education who direct programs leading to BS Child Development, BS Psychology, MS Psychology, and minors in Child Development, Psychology and Gerontology.

In addition, courses are offered which fulfill general education requirements, support other programs and serve as a personal development resource for all university students. These courses are designed to acquaint students with the facts, theories and contemporary trends in psychology and child development and how these principles can be incorporated into a more meaningful understanding of oneself and of one's interactions with others. The department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see the Study Abroad programs (p. 419).

Undergraduate Programs

BS Child Development

The Child Development major is designed for students who are interested in professions involving children and adolescents in a variety of settings. The major provides the scientific base for understanding development from birth through emerging adulthood. The program emphasizes the ecological contexts in which development occurs, including family, school, technology, community, and culture. Graduates often continue studies in graduate and credential programs, and pursue a range of careers in education, intervention programs, and human services.

The Child Development major is designed to enable students to develop a program of study suited to their individual needs and become part of a learning community of faculty and students. After completing core courses in child and adolescent development, they will develop a personal program of study by selecting electives, two internships, and a senior project. Each student graduates with a BS in Child Development.

Goals of the Child Development major are for students to:

- Learn about theories and research that have helped us to understand how children and adolescents develop physically, emotionally, socially, and intellectually.
- Study how children and youth affect and are affected by the formal and informal environments in which they grow.
- Gain experience working with children and youth of different ages and backgrounds in various settings.
- Develop expertise in the use of digital technologies to access, create, and disseminate information related to the learning and development of children and youth.

- Develop an understanding of multicultural and anti-discrimination issues and how to lead children and youth into an appreciation of diversity.
- Develop skills in research, leadership, effective communication, and community building.

BS Psychology

The Psychology major offers a broad preparation in the science of psychology. Theoretical approaches, research techniques, laboratory experiences and internships are hallmarks of the psychology program.

Graduates often pursue careers in mental health programs, social services agencies, public health settings, education institutions, and personnel-related settings. Many majors go on to graduate work in such fields of psychology as: counseling, developmental, family, social, clinical or experimental.

Students may pursue a course of study which meets their individual needs and interests. Electives are selected by the student with the advice of the student's academic advisor.

Child Development Minor

The minor is designed to provide students a broad knowledge base in child and adolescent development. Biological, cognitive, social, and emotional development are examined in context (e.g., family, school, culture). The minor builds upon students' critical thinking skills by approaching child development as a scientific area of study. This minor complements one's background in majors such as Liberal Studies, Psychology, Kinesiology, or Recreation, Parks, Tourism and Administration. An application form must be approved by a Child Development Minor advisor.

Gerontology Minor and Certificate Program

The Gerontology minor/certificate program is an interdisciplinary set of courses that prepares students in various majors whose careers will be directly or indirectly related to gerontology. The certificate program also allows non-matriculated students to develop or upgrade their skills and knowledge for those interested or already working in the field of gerontology. Coursework includes the psychological, biological, and social aspects of aging; changing roles; stress-related problems; and an understanding of the impact of an aging population on social, economic, and political institutions. *Among the requirements for admission to the program is a minimum GPA of 3.00. All applicants are reviewed by the program coordinator.*

Psychology Minor

The minor provides students with a broad background in the principles of psychology in order to develop an appreciation of the human element in the world around them, complement their professional training, and enhance their personal development and interpersonal effectiveness.

Students whose primary job responsibilities will require dealing with people should find employment opportunities increased and career advancement enhanced. Interested students are encouraged to contact the Psychology and Child Development Department for information

and application forms. An application form must be approved by a Psychology Minor advisor.

Graduate Program MS in Psychology General Characteristics

The Master of Science in Psychology is a 90-quarter unit professional degree program designed to provide the state of California with highly competent master-level clinicians who are academically prepared to obtain the marriage and family therapy (MFT) license. The program places a heavy emphasis on clinical skill training and applied experience that begins early in the program and culminates with an intensive supervised internship in a community mental health setting.

Admission to the Program

In addition to the general requirements of the University, specific requirements for admission to classified graduate standing are:

- an acceptable baccalaureate degree from an institution accredited by a regional association;
- a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted;
- satisfactory performance on the General Tests (Verbal, Quantitative, Analytical) of the Graduate Record Examination (GRE); the GRE Advanced Test in Psychology is not required;
- three letters of recommendation;
- autobiographical information;

Related work or volunteer experience is highly desirable as is having received professional counseling.

Prerequisites

Coursework in abnormal psychology, lifespan theories, personality, introductory statistics, and research methods in psychology (or related discipline). Completion of these prerequisites is necessary for admission to the program.

Classified Standing

For admission as a classified graduate student, a student shall have a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted and shall have earned an acceptable baccalaureate degree from an institution accredited by a regional association. Additionally, the student must have satisfactorily met the professional, personal, scholastic, and other standards for graduate study, including qualifying examinations, as the appropriate university authorities may prescribe. Only those applicants who show promise of success and fitness are admitted, and only those who continue to demonstrate a satisfactory level of scholastic competence and who possess appropriate personal qualities are eligible to continue in the program.

Conditionally Classified Standing

The student may enroll in a graduate degree curriculum if in the opinion of the M.S. Program Committee the student can remedy any deficiencies by additional preparation.

Advancement to Candidacy

Advancement to master's degree candidacy requires completion of a minimum of 30 quarter units of required courses in residence, specified

in a formal program of study, with a minimum grade point average of 3.0, fulfillment of the Graduation Writing Requirement, and the formal recommendation of the M.S. Program Committee. Students must maintain a minimum GPA of 3.0 in all coursework completed subsequent to admission to the program.

Program of Study

The student must maintain a grade point average of 3.0 (B) or better in all courses taken subsequent to program admission. Calculation of the grade point average includes all grades, though only the units in courses with grades of A, B, or C are counted to satisfy requirements for the degree. Required courses with a grade of D or F must be repeated.

All candidates must meet the current Graduation Writing Requirement.

Sixty-four quarter units must be completed in residence. Transfer credits are allowed if acceptable for master's degree credit at the offering institution and approved by the M.S. Program Committee.

The Master of Science degree in Psychology requires a culminating experience that includes either the completion of a thesis or passing a comprehensive exam. Each candidate must file a formal program of study by the end of the first quarter as a classified graduate student. The professional and personal growth of each graduate student is of major importance; consequently, candidates are encouraged to seek the experience of personal therapy. Students must be very aware of course prerequisites and check the catalog carefully to assure enrollment in required courses.

MFT Licensing

The Master of Science in Psychology is designed to meet the educational requirements for the Marriage and Family Therapist license (MFT) in the State of California. Students are advised to acquire and read the laws governing MFT licensure from the Board of Behavioral Science Examiners, 1625 North Market Blvd., Suite S-200, Sacramento, CA 95834. State documents must be filed by the applicant within 30 days of program graduation. See the program coordinator for the procedure required for application for this license. State documents must be filed by the applicant within 30 days of program graduation.

Grades

If a candidate for University recommendation for MFT licensure has more than one grade of C or lower among the courses to be verified for the Board of Behavioral Sciences, that form will not be approved by the Chief Academic Officer Designee of Cal Poly.

Practicum and Traineeship

Practicum and traineeship courses represent the student's demonstration of the clinical skills basic to marriage, family and child counseling. A student who receives a grade of NC in practicum or traineeship is on probation regarding continuation in the program. A second grade of NC disqualifies the student from the program and University recommendation for the license. Also, candidates may be disqualified from this program for academic-related actions judged by the M.S. Program Committee to reflect unethical and/or unprofessional conduct.

BS Child Development

Program Learning Objectives

1. Learn about theories and research that have helped us to understand how children and adolescents develop physically, emotionally, socially, and intellectually.
2. Study how children and youth affect and are affected by the formal and informal environments in which they grow.
3. Gain experience working with children and youth of different ages and backgrounds in various settings.
4. Develop expertise in the use of digital technologies to access, create, and disseminate information related to the learning and development of children and youth.
5. Develop an understanding of multicultural and anti-discrimination issues and how to lead children and youth into an appreciation of diversity.
6. Develop skills in research, leadership, effective communication, and community building.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

CD 102	Orientation to the Child Development Major	2
CD 131	Observing and Interacting with Children	4
CD 230	Preschool Laboratory	4
CD/PSY 254	Family Psychology	4
CD/PSY 256	Developmental Psychology	4
CD 304	Infant and Toddler Development	4
CD 305	Early and Middle Childhood Development	4
CD/PSY 306	Adolescence	4
PSY 323	The Helping Relationship	4
CD 329	Research Methods in Child Development	4
CD 350 or CD 351	Developmental Issues in Education Learning in Out-of-School Time	4
CD 401	Perspectives on Child and Adolescent Development	4
CD 413	Children, Adolescents & Technology	6
CD/PSY 417	Interpersonal Relationships in Childhood and Adolescence	4
CD 424	Children's Learning and Development in Diverse Families and Communities	4

CD/PSY 431	Assessing Children's Development and Environments	4
Select from the following:		8
CD 330	Supervised Fieldwork Internship	
CD 430	Advanced Supervised Fieldwork Internship	
CD 333	Research Internship	
CD 433	Advanced Research Internship	
CD 461	Senior Project Seminar	2
CD 462	Senior Project	2
SUPPORT COURSES		
BIO 302 or PSY 344	Human Genetics (B5) ¹ Behavioral Genetics	4
PSY 201 or PSY 202	General Psychology (D4) ¹ General Psychology	4
STAT 217	Introduction to Statistical Concepts and Methods (B1) ¹	4
Select from the following:		4
PSY 304	Intergroup Dialogues	
PSY 324	Psychology of Gender	
PSY 372	Multicultural Psychology	
PSY 465	Cross-Cultural International Psychology	
PSY 475	The Social Psychology of Prejudice	
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		60
FREE ELECTIVES		
Free Electives		28
Total units		180

¹ Required in Support; also satisfies GE.

General Education (GE) Requirements

- 72 units required, 12 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (4 units in Support plus 4 units in GE) ¹	4
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5) (4 units in Support) ¹	0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4

C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E) (4 units in Support) ¹	0
D5	Upper-division elective (not PSY courses)	4
Area F	Technology	
F	Upper-division elective	4
Total units		60

¹ Required in Support; also satisfies GE.

BS Psychology

Program Learning Objectives

1. Students completing foundation courses should demonstrate breadth of knowledge and application of psychological ideas to “real-world” problems.
2. Students should be able to understand scientific principles, think critically, and interpret, design, and conduct psychological research.
3. Students will develop *intrapersonal* knowledge and *interpersonal* skills to contribute to building a society responsive to multicultural and global concerns.
4. Students should demonstrate competence in writing and in oral and interpersonal communication skills.
5. Students will develop skills and experience to enable them to succeed personally and professionally.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

PSY 201 or PSY 202	General Psychology (D4) ¹ General Psychology	4
PSY 252	Social Psychology	4
PSY/CD 256	Developmental Psychology	4
PSY 305	Personality	4
PSY 323	The Helping Relationship	4
PSY 329	Research Methods in Psychology	4
PSY 333	Quantitative Research Methods for the Behavioral Sciences	3
PSY 340	Biopsychology (B5) ¹	4

PSY 372	Multicultural Psychology (USCP)	4
PSY 405	Abnormal Psychology	4
Supervised Fieldwork and/or Research Internship		
Select from the following:		10
PSY 448	Research Internship I	
PSY 449	Research Internship II	
PSY 453	Supervised Fieldwork I	
PSY 454	Supervised Field Work II	
PSY 457	Memory and Cognition	4
PSY 458	Learning	4
PSY 461	Senior Project Seminar	1
PSY 462	Senior Project	3
PSY electives (300-400 level)		20

SUPPORT COURSES

BIO 302 or PSY 344	Human Genetics Behavioral Genetics	4
STAT 217	Introduction to Statistical Concepts and Methods (B1) ¹	4

Select from the following:		4
CD 424	Children's Learning and Development in Diverse Families and Communities	
ES 320	African American Cultural Images	
ES 321	Native American Cultural Images	
ES 322	Asian American Cultural Images	
ES 323	Mexican American Cultural Images	
ES/WGS 350	Gender, Race, Culture, Science and Technology	
ES 380	Critical Race Theory	
ES 381	The Social Construction of Whiteness	
PSY 260	African American Psychology	
PSY 304	Intergroup Dialogues	
PSY 318	Psychology of Aging	
PSY/WGS 324	Psychology of Gender	
PSY 475	The Social Psychology of Prejudice	
WGS 301	Contemporary Issues in Women's and Gender Studies	
WGS 320	Women, Gender and Sexuality in Global Perspective	
WGS 340	Sexuality Studies	
WGS/RELS 370	Religion, Gender, and Society	

GENERAL EDUCATION (GE)

(See GE program requirements below.) 60

FREE ELECTIVES

Free Electives	27
Total units	180

¹ Required in Major/Support; also satisfies GE

General Education (GE) Requirements

- 72 units required, 12 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A

Communication

A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B Science and Mathematics		
B1	Mathematics/Statistics (4 units in Support plus 4 units in GE) ¹	4
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5) (4 units in Major) ¹	0
Area C Arts and Humanities		
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E Society and the Individual		
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E) (4 units in Major) ¹	0
D5	Upper-division elective (no PSY course)	4
Area F Technology		
F	Upper-division elective	4
Total units		60

¹ Required in Major/Support; also satisfies GE

Child Development Minor

Note: No more than one minor course may be taken as credit/no credit.

Required Courses

PSY 201	General Psychology	4
or PSY 202	General Psychology	
Select from the following: ¹		4
CD/EDUC 207	Children's Learning and Development in Educational Settings	
CD/PSY 256	Developmental Psychology	
Select from the following:		8
CD 304	Infant and Toddler Development	
CD 305	Early and Middle Childhood Development	
CD/PSY 306	Adolescence	
CD 350	Developmental Issues in Education	

Approved Electives

Select from the following:		8
CD 351	Learning in Out-of-School Time	
CD/PSY 417	Interpersonal Relationships in Childhood and Adolescence	

CD 424	Children's Learning and Development in Diverse Families and Communities	
CD/PSY 456	Behavioral Disorders in Childhood	
CD/PSY 460	Child Abuse and Neglect	
Total units		24

¹ CD 207 / EDUC 207 is intended for Liberal Studies Majors.

Gerontology Minor and Certificate Program

Required Courses

FSN 315	Nutrition in Aging	4
KINE 408	Exercise and Health Gerontology	3
PSY 318	Psychology of Aging	4
SOC 326	Sociology of the Life Cycle	4

Approved Electives

Select from the following: 8

ANT 344	Sex, Death, and Human Nature	
ANT 401	Culture and Health	
BIO 302	Human Genetics	
BIO 305	Biology of Cancer	
COMS 418	Health Communication	
COMS 422	Rhetorics of Science, Technology, and Medicine	
FSN 210	Nutrition	
or PSY 256	Developmental Psychology	
PHIL 339	Biomedical Ethics	
PSY 310	Psychology of Death	
PSY 317	Psychology of Stress	
PSY 459	Lifespan Theories	

Gerontology-related Fieldwork ¹

Select from the following: 4

PSY 401	Special Problems: Experiential Learning	
or advisor approved course		

Total units 27

¹ May be fulfilled as an elective in the student's major or may be challenged due to previous work.

Psychology Minor

Note: No more than one minor course may be taken as credit/no credit.

Required Courses

PSY 201	General Psychology	4
or PSY 202	General Psychology	
Select from the following:		4
STAT 217	Introduction to Statistical Concepts and Methods	
STAT 218	Applied Statistics for the Life Sciences	
STAT 251	Statistical Inference for Management I	

STAT 321	Probability and Statistics for Engineers and Scientists	
Select from the following:		8
PSY 252	Social Psychology ¹	
or PSY 254	Family Psychology	
or PSY 256	Developmental Psychology	
PSY 305	Personality	
PSY 340	Biopsychology	
PSY 405	Abnormal Psychology	
Approved PSY Electives (300-400 level)		
Select from the following:		12
PSY 301	Psychology of Personal Development	
PSY 302	Behavior in Organizations	
or BUS 387	Organizational Behavior	
PSY 304	Intergroup Dialogues	
PSY 305	Personality ²	
PSY 310	Psychology of Death	
PSY 311	Environmental Psychology	
PSY 317	Psychology of Stress	
PSY 318	Psychology of Aging	
PSY 320	Health Psychology	
PSY/WGS 324	Psychology of Gender	
PSY 325	Introduction to Positive Psychology	
PSY 329	Research Methods in Psychology	
PSY 330	Behavioral Effects of Psychoactive Drugs	
PSY 340	Biopsychology ²	
PSY 344	Behavioral Genetics	
PSY 350	Teamwork	
PSY 351	Group Dynamics	
PSY 352	Conflict Resolution: Violent and Nonviolent	
PSY 360	Applied Social Psychology	
PSY 370	Introduction to Clinical and Counseling Psychology	
PSY 372	Multicultural Psychology	
PSY 375	Forensic Psychology	
PSY 405	Abnormal Psychology ²	
PSY 410	History and Systems of Psychology	
PSY 419	Self and Identity	
PSY 430	Sensation and Perception	
PSY 432	Psychological Testing	
PSY 450	Family Intervention	
PSY/CD 456	Behavioral Disorders in Childhood	
PSY 457	Memory and Cognition	
PSY 458	Learning	
PSY 459	Lifespan Theories	
PSY/CD 460	Child Abuse and Neglect	
PSY 465	Cross-Cultural International Psychology	
PSY 475	The Social Psychology of Prejudice	
Total units		28

¹ Only one course can be counted in the minor.

² If a course is taken to meet a minor requirement, it cannot be double-counted as an approved elective for the minor.

MS Psychology

Program Learning Objectives

- Appreciation of human diversity and multicultural perspectives
- Respect for ethical standards in psychological research and practice
- Interpersonal communication skills
- Ability to understand psychological research and literature
- Knowledge about how couples and families behave in functional and dysfunctional patterns
- Knowledge of theories and research on description and explanation of personality
- Understanding psychological measurement and assessment, including reliability, validity, and standardization
- Understanding how conditioning, reinforcement, discrimination, and aversion affect behavior
- Knowledge of psychological disorders, their causes, and approaches to treatment

Required Courses

PSY 504	Psychopharmacology	4
PSY 520	Marriage & Family Therapy: Professional Identity, Theory and Practice	4
PSY 535	Child and Adolescent Psychopathology	4
PSY 555	Counseling & Communication	4
PSY 556	Multicultural Counseling and Psychology	4
PSY 560	Individual Therapy: Theory and Application	4
PSY 564	Ethics and the Law: MF Therapy	4
PSY 565	Diagnosis and Treatment: Psychopathology	4
PSY 566	Group Therapy: Theory and Application	4
PSY 569	Counseling Clinic Practicum (3) (3)	6
PSY 571	Advanced Family Therapy: Theory and Application	4
PSY 572	Child and Adolescent Therapy: Theory and Application	4
PSY 574	Psychological Assessment	4
PSY 575	Gender and Couple Therapy	4
PSY 576	Traineeship: Marital and Family Therapy (4) (4) (4) (4)	16
PSY 577	Community Mental Health: Issues and Practices	4
PSY 585	Research Methods for Counseling Psychology	4
PSY 588	Assessment and Treatment of Substance Use Disorders	4
Select from the following:		4
PSY 599	Thesis ¹	

OR

Written comprehensive exam and one of the following:

PSY 568 Advanced Psychotherapies

or an approved 400-level PSY course

Total units	90
-------------	----

¹ Must register for thesis credit each quarter of advisement.

Social Sciences

Faculty Office Bldg. (47), Room 13-C

Phone: 805.756.2260

<https://socialsciences.calpoly.edu>

Department Chair: Terry L. Jones

Academic Programs

Program name	Program type
Anthropology and Geography	BS, Minor
Latin American Studies	Minor
Sociology	BA, Minor

The Social Sciences Department offers bachelor's degrees and minors in Anthropology-Geography and Sociology, as well as a minor in Latin American studies.

Within each major, students are required to choose a concentration relevant to their future career endeavors. The Anthropology-Geography major concentrations include cross-cultural studies and international development, environmental studies and sustainability, and human ecology. Sociology majors can choose a concentration in criminal justice, organizations, or social services.

The strength of our department lies in its focus on practical training, critical thinking, and "Learn by Doing" experiences. Students are trained in applied technical skills including GIS, remote sensing, research design, social data collection, and qualitative/quantitative methodology.

Alongside these skills, students are encouraged to critically investigate contemporary issues, asking hard questions about society, behavior, and the environment in an increasingly diverse and global world. Finally, students are required to bridge classroom learning with the real world through hands-on practical experience such as internships, service learning, study abroad, and senior projects.

Undergraduate Programs

BS Anthropology and Geography

The Anthropology and Geography major provides students with the skills for understanding and examining patterns of human activity and resource utilization across space and time, as well as the interactions between humans and the natural environment. Interdisciplinary in nature, this program focuses on the applied areas of cross-cultural studies, international development, ecological research design and method, the evolution of humans, environmental assessment, and sustainability. Courses in Anthropology and Geography train students to examine human ecology from the ancient past to the modern present through courses in biological evolution, cultural adaptations, behavioral ecology, environmental impacts, and the ecology of human health and disease. In addition, students gain an understanding of the physical environment in which humans are placed, through courses in physical geography, resource management, biogeography, and climatology. Students are trained in relevant skills, including Geographic Information Systems, remote sensing, and quantitative methods.

Students interested in this major should be curious about the relationships between humans and the environment (including biology, behavior, climate and landscapes) from a broad hands-on perspective.

Our students typically have particular interest in study abroad and involvement in international opportunities.

The program offers a four-year curriculum leading to a BS degree that prepares students for careers in environmental and regional planning, cultural resources management, archaeology, international development, climatology, science education, international health research, and federal government work in behavioral analysis.

Internship or Study Abroad Requirement

As a means of promoting relevant job skills, hands-on learning, and field experience, majors are required to complete either an approved internship or study abroad program. Students who do an internship will receive a minimum of 3 units of credit (ANT 465 or GEOG 465). The department will assist students in identifying suitable internships. However, students are encouraged to explore options for themselves based on their interests. In place of an internship, students may choose to participate in a study abroad program. Four units of approved coursework taken while studying abroad will be substituted for the internship course.

Concentrations

Students may select one of the following concentrations or the individualized course of study.

International Development

Provides students with the theoretical knowledge and applied skills necessary for the study and practice of international development in cross-cultural settings. Students attain an in-depth knowledge of the social, political, economic, and ecological dimensions of international development and gain practical skills through research projects, international study, and applied internships. The concentration provides expertise and training for internationally focused careers, including public and private development institutions, the Peace Corps, the public health field, education, and numerous other careers where cross-cultural and international understanding are essential.

Environmental Studies and Sustainability

Provides students with an understanding of human environmental relationships, resource utilization, and human impact on the Earth. Current environmental issues are explained and evaluated in a global and historical context. Students learn the importance of sustainable land use practices and techniques for their successful implementation. Applied and technical skills important to assessing the environment and promoting sustainability are emphasized.

Human Ecology

Students learn about the natural environment, human behavioral and cultural systems, and the complex interrelationships between the three. Major concepts and practice emphasize broad spatial and temporal perspectives. Students acquire knowledge and skills related to global and regional climate and physical geography, human evolution, cultural ecology, behavioral ecology, prehistoric and recent environmental change, indigenous cultures of the New World, methods for analyzing climate change and related human responses in the past and present.

Other Concentration Options

With prior approval of the Social Sciences Department and the Political Science Department, students may select one of the following concentrations: Pre-Law, or Global Politics.

Individualized Course of Study

One of the two opportunities to pursue a course of study which meets a student's individual needs and interests. As their course of

study, students may pursue an academic minor or create a program, with faculty approval, based upon their interests and career goals. The coursework may be specifically tailored for a career in industry, education, government, or as preparation for graduate school.

BA Sociology

Sociology explores the nature and dynamics of human society and the interrelationship between individuals and their social groups. The goal of sociological study at Cal Poly is twofold. The first objective is to develop a sociological imagination that enables students to see their personal circumstances and problems in context of the broader, local, national, and global forces that shape their lives. The second objective is to prepare students for graduate studies and careers in such fields as criminal justice, law, social services, complex organizations, and teaching. Sociology also offers general education courses that provide an understanding of the complexity and diversity of the world's peoples and their problems. Some courses focus on American society, emphasizing issues of class, race, ethnicity and gender. Other courses have a global orientation dealing with both the past and present diversity of the world's societies, economies, politics and religions.

Internship Requirement

As a means of promoting relevant job skills, hands-on learning, and field experience, majors who select the criminal justice or social services concentrations are required to complete an approved internship. Majors who select the organizations concentration will be encouraged to complete an internship, but will not be required to do so. These internships in criminal justice or social services will be up to one year, but with a minimum of two quarters, and count for 8 to 12 units of credit (SOC 440). The department will assist students in identifying suitable internships. However, students are encouraged to explore options for themselves based upon their interests.

Concentrations

Students are required to take one of the following concentrations or the individualized course of study.

Criminal Justice

Prepares students for careers in law, law enforcement, corrections, detention, probation, parole and other criminal justice agencies.

Organizations

Students learn to apply the general principles of human behavior to the understanding of modern organizations. It prepares them for careers in business, government or non-governmental organizations.

Social Services

Provides the general principles of human social behavior and specialized professional courses to prepare for careers in the helping professions such as social work and counseling.

Other Concentration Options

With prior approval of the Social Sciences Department and the Political Science Department, students may select one of the following concentrations: Pre-Law, or Global Politics.

Individualized Course of Study

One of two opportunities to pursue a course of study which meets a student's individual needs and interests. As their course of study, students may pursue an academic minor or create a program, with faculty approval, based upon their interests and career goals. The course

of study may be specifically tailored for a career in industry, education, government, or as preparation for graduate school. When creating an individual program, it should consist of 28 units, with 16 of the 28 at the 300-400 level. Courses are selected by the student in consultation with an advising faculty member. The student must also provide a written justification for the courses and the way they constitute a cohesive, integrated course of study. The list of courses is a contract between the student and the Department.

Anthropology and Geography Minor

The minor develops broad spatial and cultural knowledge of our world. The program consists of foundation courses and directed electives that allow flexibility for students to tailor the program to meet their individual interests and goals. The objectives of the minor are to increase student awareness of the: (1) cultural and ecological diversity of the Earth's surface; (2) inter-relationships between peoples of varying cultures; (3) interactions of different cultures with their resource habitats and environmental alteration; and (4) methodologies and technologies used to evaluate cultures and environments. The goal is to instill a respect for cultural diversity and environmental sustainability. A minimum of 14 units must be upper division and taken at Cal Poly.

Latin American Studies Minor

Latin America is a region of critical importance to the United States, and California in particular. Students gain an interdisciplinary understanding of Latin America, as well as its cultural, political, and economic connections to California and the United States. This knowledge is increasingly important for a number of careers. The minor also promotes critical thinking skills and enhances the appreciation of diversity as students confront issues relevant to Latin America and US-Latin American relations.

Sociology Minor

The minor provides students with a broad understanding of contemporary society with a focus on the analysis of social change. The objectives of the program are to increase awareness of the: (1) nature of international social, economic and political structures and their consequences; (2) social results of emerging technology; (3) changes in family life, especially the role of women; and (4) changing ethnic mix in California and the United States and its implications. Coursework includes the study of the shifting demographic patterns in society, emerging life styles, the increase in the percentage of elderly in the population, and the nature of specific subculture influences.

BS Anthropology and Geography Program Learning Objectives

1. Understand and appreciate the cultural and physical attributes of major world regions, key regional issues and linkages between regions, the processes that shape cultural change and interaction, and international development issues.
2. Demonstrate an in-depth knowledge of human ecology with specific emphasis on the ecological, demographic, genetic, developmental, and epidemiological dimensions of modern human adaptations and their evolutionary foundations over time and space.

3. Comprehend the historical place of humans around the globe and apply acquired skills for cultural resource management and conservation.
4. Analyze the processes that shape the earth's physical environment (e.g. climate, landforms, water, soils, biota, and ecosystems), the distributions of natural resources, and the ways in which humans utilize natural resources and impact the environment with an emphasis on sustainability.
5. Apply scientific research methodology and design, including the ability to collect, synthesize, and interpret qualitative and quantitative cultural and ecological data using a variety of methods including the utilization of geospatial technologies (GIS, remote sensing, and GPS).
6. Critically analyze issues from multiple perspectives and communicate results effectively.
7. Synthesize information and utilize acquired skills locally and globally to improve the state of the environment and the human condition by applying cultural, ecological, and spatial knowledge, methods, and techniques.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

ANT 201	Cultural Anthropology (D3) ¹	4
ANT 202	World Prehistory	4
ANT 250	Biological Anthropology (B2) ¹	4
ANT 360	Human Cultural Adaptations	4
ANT/GEOG 455	Anthropology-Geography Research Design and Methods	4
ANT 464	Professional Preparation for Anthropologists/Geographers	1
or GEOG 464	Professional Preparation for Anthropologists/Geographers	
ANT 465	Internship ²	3
or GEOG 465	Internship	
GEOG 150	Human Geography	4
GEOG/ERSC 250	Physical Geography	4
GEOG 308	Global Geography	4
GEOG 318	Applications in GIS	4
GEOG/ERSC 333	Human Impact on the Earth	4

Methodological Elective

Select from the following:		4
ANT 310	Archaeological Field Methods	
ANT 311	Archaeological Laboratory Methods	
ANT 393	Action-oriented Ethnography	
GEOG 328	Applications in Remote Sensing	
GEOG 440	Advanced-Applications in GIS	

Regional Geography Elective

Select from the following:		4
GEOG 300	Geography of United States	
GEOG 340	Geography of California	
GEOG 370	Geography of Latin America	
GEOG 380	Geography of the Caribbean	

ANT Electives

Select from the 300-400 level	8
-------------------------------	---

GEOG Elective

Select from the 300-400 level	4
-------------------------------	---

Concentration or individualized course of study

(at least 16 units 300-400 level)	28
-----------------------------------	----

STAT 217	Introduction to Statistical Concepts and Methods (B1) ¹	4
----------	--	---

Select from the following:		4
ANT 461 & ANT 462	Senior Project I and Senior Project II	
GEOG 461 & GEOG 462	Senior Project I and Senior Project II	

GENERAL EDUCATION (GE)

(See the GE program requirements below.) ³	56-60
---	-------

FREE ELECTIVES

Electives	20-24
Total units	180

¹ Required in Major; also satisfies GE.

² Or approved study abroad course.

³ Some GE requirements may be met by course selections within the concentrations; in that case, additional free electives may be required to reach a total of 180 units.

Concentrations

Students may select one of the following concentrations or the individualized course of study.

- International Development (p. 319)
- Environmental Studies and Sustainability (p. 319)
- Human Ecology (p. 319)

Individualized Course of Study

When creating an individual program, it should consist of 28 units, with 16 of the 28 at the 300-400 level. Courses are selected by the student in consultation with an advising faculty member. The student must also provide a written justification for the courses and the way they constitute a cohesive, integrated course of study. The list of courses is a contract between the student and the Department.

General Education (GE) Requirements

- 72 units required, 12 of which are specified in Major and/or Support.
- See the complete GE course listing (<http://catalog.calpoly.edu/generalrequirementsbachelorsdegree/#generaleducationtext>).
- Minimum of 12 units required at the 300 level.

Area A Communication

A1 Expository Writing	4
-----------------------	---

A2 Oral Communication	4
A3 Reasoning, Argumentation and Writing	4
Area B Science and Mathematics	
B1 Mathematics/Statistics (4 units in Major plus 4 units in GE) ¹	4
B2 Life Science (4 units in Major) ¹	0
B3 Physical Science	4
B4 One lab taken with either a B2 or B3	0
B5 Area B Elective (select one course from B1-B5)	4
Area C Arts and Humanities	
C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts	4
C4 Upper-division elective	4
Area D/E Society and the Individual	
D1 The American Experience (Title 5, Section 40404 requirement)	4
D2 Political Economy	4
D3 Comparative Social Institutes (4 units in Major) ¹	0
D4 Self Development (CSU Area E)	4
D5 Upper-division elective (no ANT or GEOG courses)	4
Area F Technology	
F Upper-division elective (may be in Concentration)	0-4
Total units	56-60

¹ Required in Major; also satisfies GE.

Environmental Studies and Sustainability Concentration

GEOG/ERSC 325	Climate and Humanity	4
GEOG 328	Applications in Remote Sensing	4
or GEOG 440	Advanced-Applications in GIS	
GEOG/AG/EDES/ ENGR/ISLA/SCM/ UNIV 350	The Global Environment (Area F) ¹	4
GEOG 414	Global and Regional Climatology	4
or GEOG 415	Applied Meteorology and Climatology	
Problems and Issues Courses		
Select from the following:		12
AG 315	Organic Crop Production (F)	
AG 360	Holistic Management (F)	
ANT 312	Introduction to Cultural Resources Management	
BIO 112	Environmental Biology and Conservation (B5)	
BIO 114	Plant Diversity and Ecology (B2&B4)	
BIO 227	Wildlife Conservation Biology (B2)	
BRAE 345	Aerial Photogrammetry and Remote Sensing	
BRAE 348	Energy for a Sustainable Society (F)	
CRP/NR 404	Environmental Law	
EDES 406	Sustainable Environments	
ENVE 324	Introduction to Air Pollution (F)	

GEOG 301	Geography of Resource Utilization (D5)	
GEOG 408	Geography of International Development	
GEOL 201	Physical Geology	
NR 306	Natural Resource Ecology and Habitat Management	
POLS/UNIV 333	World Food Systems (F)	
PSC 320	Energy, Society and the Environment (F)	
SS 121	Introductory Soil Science (B5)	
Total units		28

¹ Required in Concentration; also meets GE.

Human Ecology Concentration

ANT 345	Human Behavioral Ecology	4
ANT 309	Elements of Archaeology	4
or ANT 320	California's Native Past	
ANT 401	Culture and Health	4
or ANT 402	Nutritional Anthropology	
Select from the following:		4
GEOG 301	Geography of Resource Utilization	
GEOG/ERSC 325	Climate and Humanity	
GEOG 408	Geography of International Development	
Select from the following:		12
ANT 310	Archaeological Field Methods	
ANT 311	Archaeological Laboratory Methods	
ANT 312	Introduction to Cultural Resources Management	
ANT 325	Pre-Columbian Mesoamerica	
ANT 330	Indigenous South Americans	
ANT 344	Sex, Death, and Human Nature	
ANT 415	Native American Cultures	
ANT 425	Meaning, Gender, and Identity in Anthropological Theory	
GEOG 300	Geography of United States	
GEOG 340	Geography of California	
GEOG 370	Geography of Latin America	
Total units		28

International Development Concentration

ANT 401	Culture and Health	4
GEOG 408	Geography of International Development	4
Problems and Issues Courses		
Select from the following:		12
ANT 325	Pre-Columbian Mesoamerica	
ANT 330	Indigenous South Americans	
ANT 344	Sex, Death, and Human Nature	

ANT 345	Human Behavioral Ecology	
ANT 402	Nutritional Anthropology	
GEOG 301	Geography of Resource Utilization	
GEOG/ERSC 325	Climate and Humanity	
GEOG 328	Applications in Remote Sensing	
GEOG 370	Geography of Latin America	
GEOG 380	Geography of the Caribbean	
GEOG 440	Advanced-Applications in GIS	
Select two from the following:		8
CRP 334	Cities in a Global World (D5)	
ECON 222	Macroeconomics (D2)	
ECON 325	Economics of Development and Growth	
POLS 328	Politics of Developing Areas	
POLS/UNIV 333	World Food Systems (Area F)	
SOC 309	The World System and Its Problems	
UNIV/AG/EDES/ ENGR/GEOG/ ISLA/SCM 350	The Global Environment (Area F)	
UNIV 391	Appropriate Technology for the World's People: Development (D5)	
UNIV 392	Appropriate Technology for the World's People: Design (Area F)	
WLC 310	Humanities in World Cultures	
Foreign Language at intermediate level (201) or credit for a comparable level of proficiency (4 units max)		
Total units		28

BA Sociology

Program Learning Objectives

1. Achieve an international/global perspective of societies
2. Develop an understanding of the problems of the U.S. as a pluralistic society
3. Learn to apply a holistic/integrated approach to social problems
4. Develop data collection skills and techniques used by modern sociology
5. Be prepared to enter careers which use the skills and knowledge of sociology
6. Demonstrate critical thinking concerning global issues
7. Demonstrate the writing skills necessary to communicate effectively

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

SOC 110	Comparative Societies (D3) ¹	4
SOC 111	Social Problems	4
SOC 218	International Political Economy (D2) ¹	4
SOC 305	Social Movements	4
or SOC 327	Social Change	
SOC/WGS 311	Sociology of Gender	4
SOC 315	Global Race and Ethnic Relations	4
SOC 316	American Ethnic Minorities (USCP)	4
SOC 323	Social Stratification	4
SOC 354	Qualitative Research Methods	4
SOC 355	Quantitative Research Methods	4
SOC 421	Social Theory	4
SOC 461	Senior Project I	2
SOC 462	Senior Project II	2
Sociology electives (300-400 level)		8
STAT 217	Introduction to Statistical Concepts and Methods (B1) ¹	4
GEOG 150	Human Geography	4
ANT 201	Cultural Anthropology	4
Concentration or individualized course of study (see list below)		28
GENERAL EDUCATION (GE)		
(See the GE program requirements below.)		60
FREE ELECTIVES		
Free Electives		24
Total units		180

¹ Required in Major/Support; also satisfies GE.

Concentration or Individualized Course of Study

Students are required to take one of the following concentrations or the individualized course of study.

- Criminal Justice (p. 321)
- Organizations (p. 321)
- Social Services (p. 321)

Individualized Course of Study

300-400 level courses selected in consultation with advising faculty. A written justification for the courses selected and the way they constitute a cohesive, integrated study is required. One-half of the units must be courses from the department.

General Education (GE) Requirements

- 72 units required, 12 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4

Area B	Science and Mathematics	
B1	Mathematics/Statistics (4 units in Major plus 4 units in GE) ¹	4
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5)	4
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy (4 units in Major) ¹	0
D3	Comparative Social Institutions (4 units in Major) ¹	0
D4	Self Development (CSU Area E)	4
D5	Upper-division elective (no SOC course)	4
Area F	Technology	
F	Upper-division elective	4
Total units		60

¹ Required in Major/Support; also satisfies GE.

Criminal Justice Concentration

SOC 402	Crime and Violence	4
SOC 406	Juvenile Justice and Delinquency	4
SOC 412	Criminology & Criminal Justice	4
SOC 440	Internship ¹	8

Applications and Issues Courses

Select from the following: ²		8
POLS 245	Judicial Process	
POLS 344	Civil Liberties	
PSY 352	Conflict Resolution: Violent and Nonviolent	
PSY 375	Forensic Psychology	
PSY 460	Child Abuse and Neglect	
SOC 301	Social Work and Social Welfare Institutions	
SOC 395	Sociology of Complex Organizations	
SOC 413	Methods of Social Work	
SOC 440	Internship ¹	
SOC 444	Incarceration and Society: Perspectives on the Criminal Justice System	
Total units		28

¹ Maximum of 12 units of SOC 440 can count towards the concentration.

² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Organizations Concentration

Select from the following: 20

SOC 310	Self, Organizations and Society
SOC 350	Social Organization of Modern Japan
SOC 395	Sociology of Complex Organizations
SOC 440	Internship ²
BUS 382	Organizations, People, and Technology
BUS 384	Human Resources Management
BUS 387	Organizational Behavior
or PSY 302	Behavior in Organizations

Approved Electives ¹

Select from the following: 8

BUS 207	Legal Responsibilities of Business
BUS 404	Governmental and Social Influences on Business
BUS 407	Managing People in Global Markets
BUS 473	Employment Law
SOC 412	Criminology & Criminal Justice
SOC 440	Internship ²

Total units 28

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² Maximum of 12 units of SOC 440 can count towards the concentration.

Social Services Concentration

SOC 301	Social Work and Social Welfare Institutions	4
SOC 413	Methods of Social Work	4
SOC 440	Internship	8

Approved Electives ¹

Select from the following: 12

ES 340	Cultural Production and Ethnicity
ES/WGS 350	Gender, Race, Culture, Science and Technology
POLS 310	The Politics of Race, Class, Gender and Sexuality
POLS 343	Civil Rights in America
POLS 419	Social Movements and Political Protest
POLS 459	The Politics of Poverty
POLS 471	Urban Politics
POLS/UNIV 333	World Food Systems
PSY 310	Psychology of Death
PSY 318	Psychology of Aging

PSY 330	Behavioral Effects of Psychoactive Drugs	
PSY/CD 306	Adolescence	
SOC 305	Social Movements	
SOC 306	Sociology of the Family	
SOC 309	The World System and Its Problems	
SOC 310	Self, Organizations and Society	
SOC 327	Social Change	
SOC 402	Crime and Violence	
SOC 406	Juvenile Justice and Delinquency	
SOC 412	Criminology & Criminal Justice	
WGS 301	Contemporary Issues in Women's and Gender Studies	
WGS 401	Seminar in Women's and Gender Studies	
WGS/RELS 370	Religion, Gender, and Society	
Total units		28

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Anthropology and Geography Minor

Required Courses

ANT 250	Biological Anthropology	4
GEOG 250	Physical Geography	4
Select from the following:		4
ANT 201	Cultural Anthropology	
ANT 202	World Prehistory	
GEOG 150	Human Geography	

Ecological Courses

Select from the following:		4
ANT 360	Human Cultural Adaptations	
GEOG 301	Geography of Resource Utilization	
GEOG 325	Climate and Humanity	
GEOG 333	Human Impact on the Earth	

Global and Regional Courses

Select from the following:		4
ANT 320	California's Native Past	
ANT 325	Pre-Columbian Mesoamerica	
ANT 330	Indigenous South Americans	
ANT 415	Native American Cultures	
GEOG 300	Geography of United States	
GEOG 308	Global Geography	
GEOG 340	Geography of California	
GEOG 370	Geography of Latin America	
GEOG 380	Geography of the Caribbean	

Special Topics

Select from the following:		4
ANT 309	Elements of Archaeology	
ANT 310	Archaeological Field Methods	
ANT 311	Archaeological Laboratory Methods	
ANT 344	Sex, Death, and Human Nature	

ANT 345	Human Behavioral Ecology
ANT 401	Culture and Health
ANT 425	Meaning, Gender, and Identity in Anthropological Theory
GEOG 408	Geography of International Development
GEOG 414	Global and Regional Climatology
GEOG 415	Applied Meteorology and Climatology

Technical Skills

Select from the following:		4
GEOG 318	Applications in GIS	
GEOG 328	Applications in Remote Sensing	
GEOG 440	Advanced-Applications in GIS	

Total units	28
-------------	----

Latin American Studies Minor

Required Courses

GEOG 370	Geography of Latin America	4
SPAN 201	Intermediate Spanish I	4
Select from the following:		4
ANT 325	Pre-Columbian Mesoamerica	
ANT 330	Indigenous South Americans	
HIST 338	Modern Latin America	
ISLA 315	Critical Issues in Latin American Studies	
POLS 328	Politics of Developing Areas (Latin America topic only)	
WLC 310	Humanities in World Cultures (Topics: Latin America or Mexico)	

Select from the following:		4
ES 243	Survey of Latino/a Studies	
ES 323	Mexican American Cultural Images	
SPAN 233	Introduction to Hispanic Readings	
WLC 312	Humanities in Chicano/a Culture	

Approved Electives

Electives ¹	8
Total units	24

¹ Unused courses from above may also count as electives. A minimum of 4 units must be 300-400 level.

Sociology Minor

Required Courses

SOC 110	Comparative Societies	4
SOC 111	Social Problems	4
SOC 309	The World System and Its Problems	4
Select from the following:		4
SOC 315	Global Race and Ethnic Relations	
SOC 316	American Ethnic Minorities	
SOC 323	Social Stratification	4

Approved Electives

Select from the following:		8
----------------------------	--	---

(SOC courses at least 4 units at 300-400 level)

Total units	28
-------------	----

Theatre & Dance

Davidson Music Center (45), Room 104
Phone: 805.756.1465
<https://theatredance.calpoly.edu>

Department Chair: Josh Machamer

Academic Programs

Program name	Program type
Theatre Arts	BA, Minor
Dance	Minor

The courses offered by the Theatre and Dance Department provide students with well-balanced programs of study, integrating practical production work with classes that examine the principles, theoretical aspects, and historical development of theatre and dance.

A full range of studio dance courses are offered that include ballet, modern, jazz, and ballroom. Composition and dance production are available, as well as courses designed for future teachers of dance. The department also provides general education and breadth courses in the areas of dance history and dance appreciation.

The department also acts as a cultural focus for the campus and community. An annual dance concert is presented under the auspices of the Orchestis Dance Company. Every spring a student-directed dance concert is also produced. Each quarter the department presents three main-stage theatre productions. Recent titles include: *A Streetcar Named Desire*, *Smash*, *Falsettos*, *Betty's Summer Vacation*, *The Bald Soprano*, *Julius Caesar*, *The Phantom Tollbooth*, *Blood Wedding (Bodas de sangre)*, *Spike Heels*, *The Arabian Nights*, *Animal Farm*, and *As You Like It*. The department also produces original works; sponsors guest lecturers and specialized workshops; and manages a program of student-directed works, field trips, and internships.

Undergraduate Programs

BA Theatre Arts

Students who major in Theatre at Cal Poly participate in a comprehensive, hands-on training program that gives them a balanced and enriched knowledge of theatre arts: acting, directing, design, playwriting, technical theatre, script analysis, and theatre history. Participation in main-stage productions, as actors and members of the artistic/production crew, is a key component of each student's education. As a small program, the Theatre Arts B.A. allows for faculty to get to know students' abilities and needs as individuals; promoting the selection of special projects, electives, and interests that mesh with their career ambitions. The Department's curriculum also offers courses as part of the University's General Education Program: Introduction to Theatre, Theatre History I & II, Theatre in the United States, Global Theatre and Performance, and Topics in Diversity on the American Stage.

Dance Minor

The Dance Minor consists of 26 units designed to provide the student with a well-balanced program in the art and education of dance. Admission to the minor is contingent upon a departmental interview and review. Students must have more than a 2.0 GPA.

Theatre Minor

The Theatre Minor is designed to provide a foundation of 12 required units in three major aspects of theatre: introduction/appreciation, design/production, and diversity. On top of that, the inclusion of 16 additional elective units allows for a degree of specialization in an area of the student's choice. Students should discuss their interests with department faculty.

Admission to the minor is contingent upon a departmental interview and review. Students must have more than a 2.0 GPA.

BA Theatre Arts

Program Learning Outcomes

1. Students will develop a fundamental knowledge of theatrical history as well as dramatic literature;
2. Students will acquire skills necessary to do script analysis;
3. Students will develop a theoretical foundation to both production and performance;
4. Students will be exposed to a variety of theatrical skills, then provided with opportunities to apply this knowledge in practical terms;
5. Students will practice values and ethics that foster a creative environment where theatrical activity can flourish;
6. Students will develop written proficiency in a wide variety of assignments.

Student Learning Objectives

- 1.1 - Understand the conventions, innovations, principles and prominent practitioners of the primary periods of theatrical history, including western and non-western forms;
- 1.2 - Recognize and demonstrate knowledge of a significant number of plays that are representative of key theatrical periods;
- 1.3 - Articulate the basic principles of the major genres of dramatic literature;
- 1.4 - Understand the political and social context in which theatre has occurred;
- 2.1 - Analyze a play from a design perspective, creating an environment that captures the theme and spirit of a play;
- 2.2 - Analyze a play from a directorial point of view, being able to articulate the structure, construct a character analysis for each role, formulate movement, and craft interaction that illuminates the theme and spirit of a play;
- 2.3 - Analyze a play from a dramaturgical perspective, understanding the historical context and social conventions in which the play was written or is set;
- 3.1 - Apply scholarly research to the process of design, playwriting, directing, and creating a character;
- 3.2 - Be able to create and communicate concepts using appropriate visual means and with vocal clarity;
- 4.1 - Understand and apply the principles and process involved in creating a design;

4.2 - Understand and apply the principles and process in directing a play;

4.3 - Understand and apply the principles and process in writing a play;

4.4 - Understand and apply the principles and process in the creation and portrayal of a character;

4.5 - Develop vocal, physical, and imaginative skills in order to express their ideas and vision;

4.6 - Understand and apply construction techniques used in building and painting scenery or construction costumes;

4.7 - Utilize scene or costume shop machinery in a safe and appropriate manner;

4.8 - Understand the role of the stage manager, publicist, producer, house manager and box office manager;

5.1 - Develop an understanding of diverse and non-traditional theatrical conventions and viewpoints;

5.2 - Practice discipline, develop strong time management skills, and display commitment to process;

5.3 - Work in a respectful, collaborative environment;

6.1 - Understand the research process and write research reports;

6.2 - Critically analyze theatre performance through written reviews;

6.3 - Write a one-act play;

6.4 - Write coherent, persuasive critical analysis essays in a variety of topics drawn from history, literature, and theory.

TH 305	Topics in Diversity on the American Stage (USCP)	4
TH 330 or TH 325	Stagecraft II Costume Construction II	4
TH 350	Seminar in Playwriting	4
TH 430 or TH 432	Scenic Design Costume Design	4
TH 450	Directing	4
TH 461	Senior Project Seminar	3
Select from the following (lower division):		4
TH 240	Improvitational Theatre	
TH 245	Introduction to Stage Management	
TH 260	Voice and Diction for the Stage ²	
TH 270	Stage Make-Up ²	
TH 275	Selected Topics ³	
TH 280	Body Awareness and Expression ²	
TH 285	Internship	
Select from the following (upper division):		12
TH 305	Topics in Diversity on the American Stage (USCP) ³	
TH 325	Costume Construction II ³	
TH 330	Stagecraft II ³	
TH 341	Advanced Acting Studio ³	
TH 345	Rehearsal and Performance	
TH 360	Theatre in the United States	
TH 370	Costume History	
TH 380	Theatre for Young Audiences	
TH 390	Global Theatre and Performance	
TH 400	Special Problems for Advanced Undergraduates ³	
TH 430	Scenic Design ²	
TH 432	Costume Design ²	
TH 434	Lighting Design	
TH 470	Selected Advanced Topics ³	
TH 471	Selected Advanced Laboratory ³	
TH 480	Advanced Internship	

SUPPORT COURSES

ENGL 339	Introduction to Shakespeare (C4) ¹	4
Select from the following (lower division 100-200 level):		4
ISLA 240	Introduction to Media Arts and Technologies	

or

any ARCH, ART, DANC, MU course(s)

Select from the following (upper division 300-400 level):		4
LS 310	Storytelling: Modern Applications of Traditional Narrative	
or		
any ARCH, ART, DANC, ENGL, ISLA, MU course(s)		

GENERAL EDUCATION (GE)

(See the list GE requirements below.)

64

FREE ELECTIVES

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

TH 101	First-Year Theatre Seminar	1
TH 210	Introduction to Theatre (C3) ¹	4
TH 220	Acting Methods	4
TH 225	Costume Construction I	4
TH 227	Theatre History I	4
TH 228	Theatre History II	4
TH 230	Stagecraft I	4
TH 260 or TH 270 or TH 280	Voice and Diction for the Stage Stage Make-Up Body Awareness and Expression	4
TH 290	Script Analysis	4
TH 295	Foundations in Theatrical Design	4

Electives (At least 9 units must be upper division)	28
Total units	180

¹ Required in Major; also satisfies GE.

² If not used to meet Major core requirements, these courses meet Major electives.

³ Repeatable courses, if taken twice with different topics, can be used to meet Theatre Major electives as well as Major core requirements.

General Education (GE) Requirements

- 72 units required, 8 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics	8
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5)	4
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts (4 units in Major) ¹	0
C4	Upper-division elective (4 units in Support, No TH courses) ¹	0
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		64

¹ Required in Major; also satisfies GE

Dance Minor

Program Learning Objectives

1. Students will demonstrate an integrated understanding of dance training principles and competency in a variety of dance techniques that support performance.
2. Students will demonstrate the ability to apply fundamental principles of dance composition to their own creative process. They will

recognize various choreographic processes, aesthetic properties of style, and the relationship between form and content.

3. Students will develop a fundamental knowledge of body mechanics, anatomy, kinesiology, and somatic practices applicable to work in dance, physical activity and health.
4. Students will recognize crucial historical developments, significant artistic works and philosophical constructs within dance history.
5. Students will communicate ideas effectively through oral, written, choreographic and performance skills, including technologically mediated work.
6. Students will demonstrate critical thinking and creative problem solving skills in theoretical and practical applications.
7. Students will understand cultural, gender, age, and aesthetic diversity through the study of dance.

Required Courses

DANC 221	Dance Appreciation	4
DANC 231	Intermediate Ballet	2
DANC 232	Intermediate Modern Dance	2
DANC 233	Intermediate Jazz Dance	2
DANC 340	Dance Composition	4

Emphasis Elective

Select from the following: 4

DANC 331	Advanced Ballet and Repertory
DANC 332	Contemporary Dance Repertory
DANC 341	Dance Concert Practicum
DANC 345	Choreography/Workshop in Dance Concert Preparation
DANC 346	Dance Production
DANC 381	Dance Teaching Methods for Dance Minors
DANC 400	Special Problems

Electives

Select from the following: 8

(at least 6 elective units must be upper division)		
DANC 130	Pilates and Conditioning Fundamentals	
DANC 135	International Folk Dance	
DANC 210	Active Wellness	
DANC 234	Intermediate Ballroom Dance	
DANC/TH 280	Body Awareness and Expression	
DANC 331	Advanced Ballet and Repertory	
DANC 332	Contemporary Dance Repertory	
DANC 341	Dance Concert Practicum	
DANC 345	Choreography/Workshop in Dance Concert Preparation	
DANC 346	Dance Production	
DANC 400	Special Problems	
DANC 430	Advanced Selected Techniques	
DANC 470	Selected Advanced Topics	
DANC 471	Selected Advanced Laboratory	

Total units 26

Theatre Minor

Required Courses

TH 210	Introduction to Theatre	4
TH 230	Stagecraft I	4
or TH 225	Costume Construction I	
TH 305	Topics in Diversity on the American Stage ¹	4

Theatre Electives

Select any TH courses not already used to meet Minor requirements. At least 12 units must be upper division. ¹	16
Total units	28

¹ Repeatable course, if taken twice with different topics, can be used to meet Minor electives as well as Minor core requirement.

Women's and Gender Studies

Faculty Office Building (Bldg. 47), Room 25H
Phone: 805.756.1525
<https://wgs.calpoly.edu>

Department Chair: Jane Lehr

Academic Program

Program name	Program type
Queer Studies	Minor
Women's and Gender Studies	Minor

Undergraduate Programs

Queer Studies Minor

The Queer Studies (QS) minor provides students with opportunities to explore how sexuality is central to human societies. The Queer Studies minor promotes intersectional, interdisciplinary scholarly inquiry, education and activism that emphasizes how constructions, experiences and expressions of sexuality (including the invention of homo/heterosexuality and ab/normality, intimacy, kinship networks and embodiment) change over time and are lived in relation to interlocking systems of race, ethnicity, religion, class, nation, age, dis/ability and gender. Students completing the minor will develop the intellectual and practical skills necessary to contribute to scholarship, creative production and innovation in the interdisciplinary field of Queer Studies and to serve as leaders in the creation, enactment and evaluation of efforts to create a more inclusive, just and equitable world.

Women's and Gender Studies Minor

The Women's and Gender Studies (WGS) Minor empowers students to question and contribute to knowledge creation, community formation, activism, creative practice, and policymaking from interdisciplinary feminist perspectives. The WGS minor encourages active student learning and sophisticated engagement, and a critical understanding of how genders and sexualities shape and are shaped by social, political, ethical, economic, legal and cultural institutions in historical and contemporary contexts. Areas of exploration include femininities, masculinities, and other gender identities. The Women's & Gender Studies minor promotes scholarly inquiry, education and activism that utilizes an integrative approach, exploring the intersections of gender, race, class, sexuality, ethnicity, religion, dis/abilities, citizenship status, and other social categories within both national and transnational contexts.

Queer Studies Minor

Program Learning Objectives

1. Students will develop skills in critical thinking, creativity, lifelong learning and communication (including oral, written and visual) to multiple audiences.
2. Students will demonstrate substantial knowledge of foundational and contemporary research in the interdisciplinary field of Queer Studies, and substantial knowledge of the Queer Studies theoretical literature.
3. Students will gain an understanding of how the interdisciplinary field of Queer Studies creates new knowledge and draws upon and utilizes perspectives from multiple fields across the humanities, arts and social sciences.

4. Students will understand the ways in which constructions, experiences and expressions of sexuality shape and are shaped by social, political, ethical, institutional, economic, legal, cultural, scientific and technological factors in the past and present, with special attention paid to interlocking systems of race, ethnicity, religion, class, nation, age, dis/ability and gender in local, national and transnational contexts.
5. Students will understand the ways in which the dynamics of heterosexism and heteronormativity shape and are shaped by social, political, ethical, institutional, economic, legal, cultural, scientific and technological factors in the past and present, with special attention paid to interlocking systems of race, ethnicity, religion, class, nation, age, dis/ability and gender in local, national and transnational contexts.
6. Students will employ key concepts in Queer Studies to contribute to scholarship, creative production and innovation.
7. Students will develop the intellectual and practical skills necessary to engage with issues of social justice and serve as leaders in the creation, enactment, and evaluation of efforts to create a more inclusive, just and equitable world.

Required Courses

ANT 460	Queer Anthropology ¹	4
or HIST 458	Gender and Sexuality in Modern Europe	
WGS 302	Contemporary Issues in Queer Studies ²	4
WGS 340	Sexuality Studies	4
WGS/ES 345	Queer Ethnic Studies	4

Approved Electives

Select from the following: ^{3, 4}		8
ANT 344	Sex, Death, and Human Nature	
ANT 393	Action-oriented Ethnography	
ANT 425	Meaning, Gender, and Identity in Anthropological Theory	
BIO 123	Biology of Sex	
ENGL 382	LGBT Literature and Media	
300- and 400-level English Topics/Subtitle courses as approved ⁴		
ES 112	Race, Culture and Politics in the United States	
or ES 241	Survey of Indigenous Studies	
or ES 242	Survey of Africana Studies	
or ES 243	Survey of Latino/a Studies	
or ES 244	Survey of Asian American Studies	
ES 325	Sexuality and Gender in African American Communities	
ES 340	Cultural Production and Ethnicity	
or ES 380	Critical Race Theory	
or ES 381	The Social Construction of Whiteness	
HIST/HNRS 216	Comparative Social Movements	
HIST 433	History of the American West, Southwest Borderlands, and California	
or HIST 459	Imperialism and Postcolonial Studies	
ISLA 320	Topics and Issues in Values, Media and Culture ⁴	

KINE 323	Sport and Gender	
PHIL/WGS 336	Feminist Ethics, Gender, Sexuality and Society	
POLS 310	The Politics of Race, Class, Gender and Sexuality	
PSY/CRP 304	Intergroup Dialogues	
PSY/WGS 324	Psychology of Gender	
PSY 475	The Social Psychology of Prejudice	
RELS/WGS 370	Religion, Gender, and Society	
SOC 306 or SOC 327	Sociology of the Family Social Change	
SOC/WGS 311	Sociology of Gender	
TH 305	Topics in Diversity on the American Stage ⁴	
WGS 270	Selected Topics ^{4, 5}	
WGS 320	Women, Gender and Sexuality in Global Perspective	
WGS 400	Special Problems for Advanced Undergraduates ^{4, 5}	
WGS 401	Seminar in Women's and Gender Studies ⁴	
WGS 467	Women's and Gender Studies Internship ⁵	
Total units		24

¹ The QS Core course not taken to meet QS Core requirements (ANT 460 or HIST/WGS 458) can be used to meet QS Elective requirements.

² This repeatable QS Core course, if repeated for 8 units with different subtitles, can also be used to meet QS Elective requirements.

³ Please check prerequisites. Your ability to select specific courses may vary depending upon your major's curriculum requirements.

⁴ Minor Advisor approval required for topics/subtitle courses. Approval is dependent on topic/subtitle. Contact the Women's & Gender Studies Department for a list of approved subtitles.

⁵ At least 4 units of credit must be earned in this course for it to count as an elective in the QS minor.

Women's and Gender Studies Minor Program Learning Objectives

- Students will develop skills in critical thinking, writing, and oral communication.
- Students will demonstrate substantial knowledge of foundational and contemporary research and theoretical literature in the field of Women's & Gender Studies.
- Students will gain an understanding of how the interdisciplinary field of Women's and Gender Studies creates new knowledge and draws upon and utilizes the perspective of multiple fields, such as the humanities, arts, and social and behavioral sciences.
- Students will understand the ways in which genders and sexualities shape and are shaped by social, political, ethical, economic, legal, cultural, scientific and technological factors and institutions in historical and contemporary contexts, with special attention paid to the intersections of gender, race, and class, and sexuality in national and transnational contexts.

- Students will employ key concepts in Women's & Gender Studies scholarship to conduct independent research and analyses on a variety of topics.
- Students will develop skills that allow them to identify and engage with issues of social justice.

Required Courses

WGS 201	Introduction to Women's and Gender Studies in the United States	4
WGS 301	Contemporary Issues in Women's and Gender Studies ¹	4
WGS 450	Feminist Theory	4

Core Courses

Select from the following:² 8

WGS/SOC 311	Sociology of Gender
WGS/ART 316	Women as Subject and Object in Art History
WGS 320	Women, Gender and Sexuality in Global Perspective
WGS/PSY 324	Psychology of Gender
WGS/PHIL 336	Feminist Ethics, Gender, Sexuality and Society
WGS 340	Sexuality Studies
WGS/ES 350	Gender, Race, Culture, Science and Technology
WGS/ES 351	Gender, Race, Class, Nation in Global Engineering, Technology & International Development
WGS/RELS 370	Religion, Gender, and Society
WGS 401	Seminar in Women's and Gender Studies ³
WGS/POLS 417	Feminist Legal Theory
WGS/HIST 434	American Women's History to 1870
WGS/HIST 435	American Women's History from 1870
WGS/POLS 457	U.S. Reproductive Politics
WGS/HIST 458	Gender and Sexuality in Modern Europe
WGS 467	Women's and Gender Studies Internship ³

Approved Electives

Select from the following:^{2, 4} 4

ANT 401	Culture and Health
ANT 425	Meaning, Gender, and Identity in Anthropological Theory
COMS 315	Intergroup Communication
COMS 316	Intercultural Communication
COMS 319	Critical Cultural Studies and Communication
COMS 421	Gender and Communication
COMS 428	Family Communication
ENGL 345	Women Writers of the Twentieth Century
ENGL 349	Gender in Twentieth Century Literature

ENGL 439	Significant British Writers ⁵
ENGL 449	Significant American Writers ⁵
ENGL 459	Significant World Writers ⁵
ENGR 301	Engineering Professional Success
ES 300	Chicano/a Non-Fiction Literature
ES 325	Sexuality and Gender in African American Communities
ES 340	Cultural Production and Ethnicity
ES 380	Critical Race Theory
ES 381	The Social Construction of Whiteness
HIST 216	Comparative Social Movements
HIST 421	The History of Prostitution
ISLA 320	Topics and Issues in Values, Media and Culture ⁵
KINE 260	Women's Health Issues
KINE 323	Sport and Gender
MU 328	Women in Music
POLS 310	The Politics of Race, Class, Gender and Sexuality
PSY/CRP 304	Intergroup Dialogues
TH 305	Topics in Diversity on the American Stage ⁵
WGS 270	Selected Topics ³
WGS 400	Special Problems for Advanced Undergraduates ³
WGS 470	Selected Advanced Topics ³
<hr/>	
Total units	24

¹ These repeatable WGS courses, if repeated for up to 8 units with different subtitles, can be used to meet WGS Core or Elective requirements.

² Please check prerequisites. Your ability to select specific courses may vary depending upon your major's curriculum requirements.

³ A total of 4 units of credit must be earned to meet the 4-unit elective requirement.

⁴ Any course listed in the WGS Core, if not used to meet Core requirements, can be used as an Elective.

⁵ Minor Advisor approval required for this course to count as a WGS elective. Approval is dependent on subtitle. Contact the department for a list of approved subtitles.

World Languages and Cultures

Faculty Office Bldg. (47), Room 28

Phone: 805.756.1205

Email: wlc@calpoly.edu

<https://wlc.calpoly.edu>

Department Chair: John Thompson

Academic Programs

Program name	Program type
French	Minor
German	Minor
Italian Studies	Minor
Modern Languages and Literatures	BA
Spanish	Minor

The World Languages and Cultures Department offers coursework in beginning, intermediate, and advanced French, German, and Spanish, as well as coursework in beginning and intermediate Mandarin Chinese, Italian, and Japanese. Instruction at all levels emphasizes communicative competence and the use of authentic media to prepare students for cultural, educational, literary and professional needs in California, throughout the United States, and abroad.

Students who wish to enroll in language courses for the first time at Cal Poly, numbered 101 through 203, must take the requisite Placement Examination prior to enrolling. Students who have never studied the desired language must begin at 101. Students should contact the World Languages and Cultures Department for test dates and procedures.

The department supports the concept of international education and encourages students to investigate opportunities for meaningful international study, internships, and educational experiences. The department works with Cal Poly's and the CSU's International Programs to ensure that courses taken in an experience abroad count toward either major, support, minor, general education and/or free electives, as appropriate. Students interested in studying abroad should consult with the Cal Poly International Center Office and their assigned academic advisor well in advance.

The department also supports such student clubs as the Cal Poly Spanish Language Club, the Chinese Cultural Club, and MEXA (Movimiento Estudiantil Xicano de Aztlán), as well as sponsoring a quarterly film series and other cultural events such as the Chinese New Year celebration and the German Winter Festival.

The World Languages Center (WLC) is the department's digital language laboratory and multimedia teaching facility. Students and faculty members use the Center for class activities and presentations, and for drop-in language practice and curriculum development.

Undergraduate Programs

BA Modern Languages and Literatures

Students with majors and minors in World Languages and Cultures have been successful in careers in education, international business, finance, non-profit agencies, the viticulture industry, and government service. Others have attended graduate and professional schools in various fields, including languages and literatures, linguistics, speech pathology, law, medicine, and engineering. Our graduates have also been selected to

teach in secondary schools in Spain (North American Language and Culture Assistants) and France (Teaching Assistant Program in France). In collaboration with the Cal Poly School of Education, we also prepare students for the California single-subject World Languages Teaching Credential. Finally, we work closely with our students to integrate junior- or senior-level education abroad experiences, internships or service-learning experiences in the U.S. or another country, or equivalent professional-level hands-on experiences (with departmental approval) as part of their total capstone experience.

French Minor

German Minor

Italian Studies Minor

The Italian Studies minor provides students with opportunities to explore how the language and culture of Italy are central to the arts, humanities, and sciences in the Western tradition. In addition, students learn about the central role Italy plays on the world stage as one of the founders of Nato, of the European Union, and as one of the seven most industrialized nations (G7). Required coursework focuses on acquiring intermediate proficiency in the language (Italian 102 through 201), together with a solid foundation in the humanities (WLC 310 Culture of Italy), while the upper-division electives come from a variety of complementary fields, including art, music, history, and political science.

Spanish Minor

BA Modern Languages and Literatures

Program Learning Objectives

The Modern Languages and Literatures program provides students opportunities to:

1. Learn to communicate effectively through speaking, listening, reading, and writing in authentic target-language situations.
2. Develop communicative and intercultural competency so that they can work productively both as individuals and in collaboration with others.
3. Gain perspective on cultural and historical achievements in the target-language cultures as well as on relevant issues of diversity.
4. Cultivate awareness of ethical and professional perspectives that reflect linguistic and cultural heritage.
5. Think critically and creatively using the target languages and negotiate meaning between the target languages and English.
6. Develop the life-long ability to evaluate ways in which language and culture provide perspective on the larger world of the arts, sciences, and technology.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses

- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major or support courses may be selected as credit/no credit.

MAJOR COURSES

Primary Language

SPAN 201	Intermediate Spanish I	4
SPAN 202	Intermediate Spanish II	4
SPAN 203 or SPAN 206	Intermediate Spanish III Spanish for Heritage Speakers	4
SPAN 207	Introduction to Spanish Linguistics	4
SPAN 233	Introduction to Hispanic Readings (C1) ¹	4
SPAN 301	Advanced Composition in Spanish	4
SPAN 302	Advanced Conversation and Composition in Spanish	4

SPAN 300-level courses

Select from the following: 8

(see catalog description for credit limits on variable topic courses)

SPAN 303	Introduction to English-Spanish Translation	
SPAN 305	Significant Works in Spanish	
SPAN 307	Spanish and Latin American Film	
SPAN 340	Chicano/a Authors	

SPAN 400-level courses

Select from the following: 8

SPAN 402	Advanced Topics in Spanish Linguistics	
SPAN 410	Advanced Literature in Spanish	
SPAN 416	Don Quixote	
SPAN 470	Selected Advanced Topics	
WLC 360	Research Methods in World Languages and Cultures	4
WLC 460	Senior Project	4

Approved language/culture electives (300-400 level) ⁵

(See Approved Language/Culture Elective list below) 12

Secondary Language Concentration or Minor

Select one of the following: 32

A. Secondary language concentration (32 units) ²

Elementary courses: 101, 102, 103 (12 units)

Intermediate courses: 201, 202, 203 (12 units)

Critical Reading course: 233 (4 units) ³

Advanced language course: 300-400 level (4 units) ⁴

B. Minor and Upper-Division SPAN Courses (32 units)

SPAN 300-400 level courses (2-8 units)

With signature of advisor, any course used in a declared academic minor not used to meet MLL major requirements (24-30 units) ^{5,8}

GENERAL EDUCATION (GE)

(See GE program requirements below.) 68

FREE ELECTIVES

Free Electives ⁵ 16

Total units 180

Approved Language/Culture Electives (300-400 level)

Select from the following: 12

AG/EDES/ENGR/ISLA/SCM/UNIV 350	The Global Environment
AGB 318	Global Agricultural Marketing and Trade
ANT 325	Pre-Columbian Mesoamerica
ANT 330	Indigenous South Americans
ANT 360	Human Cultural Adaptations
ANT 401	Culture and Health
ANT 415	Native American Cultures
ART 311	Art History - Nineteenth Century Art
ART 313	Design History
ART 315	Art History - Art Since 1945
ART/WGS 316	Women as Subject and Object in Art History
ART 318	Asian Art Topics: National, Religious, and Intellectual Movements
BUS 402	International Business Management
BUS 403	Advanced Seminar in International Management
BUS 410	The Legal Environment of International Business
CD/PSY 306	Adolescence
CD 350	Developmental Issues in Education
COMS 308	Group Performance of Literature
COMS 311	Communication Theory
COMS 315	Intergroup Communication
COMS 316	Intercultural Communication
COMS 421	Gender and Communication
DANC 321	Cultural Influence on Dance in America
ECON/HNRS 303	Economics of Poverty, Discrimination and Immigration
ECON 330	International Trade Theory
EDUC 423	Bilingual Literacy
EDUC 433	Foundations of Bilingual Education
ENGL 302	Writing: Advanced Composition
ENGL 346	Ethnic American Literature
ENGL/HNRS 380	Literary Themes
ENGL 390	The Linguistic Structure of Modern English
ENGL 391	Topics in Applied Linguistics
ENGL 459	Significant World Writers
ENGL 495	Topics in Applied Language Study
ENGL 497	Theories of Language Learning and Teaching

ENGL 498	Approaches to Teaching English as a Second Language/Dialect
ENGL 499	Practicum in Teaching English as a Second Language/Dialect
ENGL 503	Graduate Introduction to Linguistics
ES 300	Chicano/a Non-Fiction Literature
ES 321	Native American Cultural Images
ES 322	Asian American Cultural Images
ES 323	Mexican American Cultural Images
ES/ARCH 326	Native American Architecture and Place
ES 330	The Chinese American Experience
ES 340	Cultural Production and Ethnicity
ES/NR 360	Ethnicity and the Land
ES 380	Critical Race Theory
FR 301	Advanced French Composition and Grammar ⁶
FR 302	Advanced French Conversation and Grammar ⁶
FR 305	Significant Works in French ⁷
FR 350	French Literature in English Translation ⁷
FR 470	Selected Advanced Topics ⁷
GEOG 308	Global Geography
GEOG 370	Geography of Latin America
GER 301	Advanced German Composition and Grammar ⁶
GER 302	Advanced German Conversation and Grammar ⁶
GER 305	Significant Works in German ⁷
GER 350	German Literature in English Translation ⁷
GER 470	Selected Advanced Topics ⁷
HIST 306	The Witch-Hunts in Europe, 1400-1800
HIST 310	East Asian Culture and Civilization
HIST 314	Middle East
HIST 316	Modern East Asia
HIST 319	Modern South and Southeast Asia
HIST 341	Modern Central America
HIST 337	Colonial Latin America
HIST 338	Modern Latin America
HIST 416	Modern Japan
HIST 417	20th Century China
HIST 418	Chinese Film and History
HIST 437	Nazi Germany
HIST 452	Renaissance and Reformation Europe
ISLA 315	Critical Issues in Latin American Studies
LS 310	Storytelling: Modern Applications of Traditional Narrative
PHIL 312	Medieval Philosophy
PHIL 313	Early Modern Rationalism

PHIL 315	Kant and 19th Century European Philosophy
PHIL 320	Asian Philosophy
PHIL 336	Feminist Ethics, Gender, Sexuality and Society
PHIL 350	Aesthetics
PHIL 423	Philosophy of Language
POLS 310	The Politics of Race, Class, Gender and Sexuality
POLS 324	International Relations Theory
POLS 325	Global Political Issues
POLS 339	Authoritarian and Democratic Rule
POLS 429	Issues and Topics in International Relations
PSY 458	Learning
RELS 304	Judaism
RELS 306	Hinduism
RELS 307	Buddhism
RELS 310	Christianity
RELS 311	Islam
RELS/WGS 370	Religion, Gender, and Society
RPTA 314	Sustainable Travel and Tourism Planning
SOC 309	The World System and Its Problems
SOC/WGS 311	Sociology of Gender
SOC 313	Urban Sociology
SOC 315	Global Race and Ethnic Relations
SOC 316	American Ethnic Minorities
SOC 350	Social Organization of Modern Japan
SPAN 303	Introduction to English-Spanish Translation
SPAN 305	Significant Works in Spanish ⁷
SPAN 307	Spanish and Latin American Film ⁷
SPAN 340	Chicano/a Authors (USCP)
SPAN 350	Hispanic Literature in English Translation ⁷
SPAN 351	Chicano/Latino Writers in the United States
SPAN 410	Advanced Literature in Spanish ⁷
SPAN 470	Selected Advanced Topics ⁷
TH 350	Seminar in Playwriting
TH 390	Global Theatre and Performance
WGS 320	Women, Gender and Sexuality in Global Perspective
WGS/ES 350	Gender, Race, Culture, Science and Technology
WGS 450	Feminist Theory
WLC 310	Humanities in World Cultures ^{6,7}
WLC 312	Humanities in Chicano/a Culture
WLC 318	Culture of Spain: Activities
WLC 370	Language, Technology and Society
WLC 424	Methods in Teaching Languages Other Than English

WLC 470	Selected Advanced Topics ⁷
---------	---------------------------------------

- ¹ Required in Major; also satisfies GE
- ² Secondary language: French, German, Mandarin Chinese, or other language approved by Department Chair. Required coursework for approved secondary language that is not available through Cal Poly must be fulfilled through approved transfer credit.
- ³ If Mandarin Chinese is selected as the student's secondary language concentration, a department-approved upper-division course with significant Chinese culture and critical thinking components will be substituted for this course.
- ⁴ FR, GER (300-400 level), WLC 310 "Culture of France" or "Culture of Germany", or upper-division work in other language approved by Department Chair.
- ⁵ If upper-division GE courses are used to satisfy Major or Support requirements, additional upper-division coursework may be required to satisfy the University's 60-units upper-division requirement.
- ⁶ May be used as an elective, if not being used as part of required courses. May not be counted twice.
- ⁷ May be counted multiple times if taken with different subtitles.
- ⁸ Exceptions: French Minor, German Minor, Spanish Minor, Italian Studies Minor. Academic policy states that a major and a minor cannot be taken in the same degree program.

General Education (GE) Requirements

- 72 units required, 4 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics	8
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5)	4
Area C	Arts and Humanities	
C1	Literature (4 units in Major) ¹	0
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective (no SPAN, FR, GER courses)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	

F	Upper-division elective	4
Total units		68

- ¹ Required in Major; also satisfies GE

French Minor

Required Courses

FR 202	Intermediate French II	4
FR 203	Intermediate French III	4
FR 233	Critical Reading in French Literature	4

Approved Electives

Select from the following:		12
FR 301	Advanced French Composition and Grammar	
FR 302	Advanced French Conversation and Grammar	
FR 305	Significant Works in French ¹	
FR 350	French Literature in English Translation ¹	
FR 470	Selected Advanced Topics ¹	
WLC 310	Humanities in World Cultures (Culture of France)	
WLC 370	Language, Technology and Society	
WLC 400	Special Problems for Advanced Undergraduates ¹	
WLC 470	Selected Advanced Topics ¹	

Total units		24
-------------	--	----

- ¹ Repeatable to 8 units.

German Minor

Required Courses

GER 202	Intermediate German II	4
GER 203	Intermediate German III	4
GER 233	Critical Reading in German Literature	4

Approved Electives

Select from the following:		12
GER 301	Advanced German Composition and Grammar	
GER 302	Advanced German Conversation and Grammar	
GER 305	Significant Works in German ¹	
GER 350	German Literature in English Translation ¹	
GER 470	Selected Advanced Topics ¹	
WLC 310	Humanities in World Cultures (Culture of Germany)	
WLC 370	Language, Technology and Society	
WLC 400	Special Problems for Advanced Undergraduates ¹	
WLC 470	Selected Advanced Topics ¹	

Total units		24
-------------	--	----

¹ Repeatable to 8 units.

Italian Studies Minor

Required Courses

ITAL 102	Elementary Italian II	4
ITAL 103	Elementary Italian III	4
ITAL 201	Intermediate Italian I	4
WLC 310	Humanities in World Cultures (Topic: Culture of Italy)	4

Approved 300-400 Level Electives

Select from the following: 8

ART 370	Michelangelo
ART 371	Topics in Renaissance Art (Topics: Art and Politics in Renaissance Italy; Art of Love in the Renaissance)
HIST 307	European Thought 1800-2000
HIST 334	Modern Europe, 1789-1914
HIST/HNRS 335	Modern Europe, 1914-Present
HIST 452	Renaissance and Reformation Europe
POLS 329	Ancient and Medieval Political Thought
POLS 383	Politics of the European Union
WLC 400	Special Problems for Advanced Undergraduates

Total units 24

Spanish Minor

Required Courses

SPAN 202	Intermediate Spanish II	4
SPAN 203	Intermediate Spanish III	4
or SPAN 206	Spanish for Heritage Speakers	
SPAN 207	Introduction to Spanish Linguistics ¹	4
or SPAN 233	Introduction to Hispanic Readings	

Approved Electives

Select from the following: 12

SPAN 301	Advanced Composition in Spanish
SPAN 302	Advanced Conversation and Composition in Spanish
SPAN 303	Introduction to English-Spanish Translation
SPAN 305	Significant Works in Spanish ²
SPAN 307	Spanish and Latin American Film ²
SPAN 340	Chicano/a Authors
SPAN 350	Hispanic Literature in English Translation
SPAN 351	Chicano/Latino Writers in the United States
SPAN 390	Introduction to Creative Writing in Spanish
SPAN 402	Advanced Topics in Spanish Linguistics
SPAN 410	Advanced Literature in Spanish

SPAN 416	Don Quixote
SPAN 470	Selected Advanced Topics ²
WLC 310	Humanities in World Cultures (Culture of Spain, Mexico or Latin America)
WLC 312	Humanities in Chicano/a Culture
WLC 370	Language, Technology and Society
WLC 400	Special Problems for Advanced Undergraduates ²
WLC 470	Selected Advanced Topics ²
Total units	24

¹ SPAN 207 does not serve as prerequisite for upper-division literature or film courses taught in Spanish.

² Repeatable to 8 units.

College of Science & Mathematics

Faculty Offices East (25), Room 229

Phone: 805.756.2226

<http://www.cosam.calpoly.edu>

Dean: Dean E. Wendt

Associate Dean: Derek Gragson

Associate Dean: Kellie Green Hall

Associate Dean: Camille O'Bryant

Academic Programs

Program name	Program type
Actuarial Preparation	Minor
Astronomy	Minor
Biochemistry	BS
Biological Sciences	BS, MA, MS
Biology	Minor
Biotechnology	Minor
Chemistry	BS
Cross Disciplinary Studies Minor in Data Science	Minor
Environmental Studies	Minor
Geology	Minor
Kinesiology	BS, MS
Liberal Studies	BS
Marine Sciences	BS
Mathematics	BS, MS, Minor
Microbiology	BS, Minor
Physics	BA, BS, Minor
Polymers and Coatings Science	MS
Public Health	BS
Statistics	BS, Minor

School of Education Programs

Program name	Program type
Administrative Services	Credential
Agriculture Specialist	Teaching Credential
Curriculum and Instruction	MA
Higher Education Counseling and Student Affairs	MS
Education	MA
Educational Leadership and Administration	MA
Special Education	MS
Special Education (Education Specialist - Mild/Moderate Disabilities)	Credential
Multiple Subject	Teaching Credential
Single Subject	Teaching Credential

See the School of Education (p. 386) section for further information.

Mission

The mission of the College of Science and Mathematics is to facilitate learning, understanding, and appreciation of science and mathematics as a basis for creative endeavors, intellectual pursuits, careers, and critical consideration of issues confronting society. The College has two equally important roles: (1) to provide specialized coursework for

students enrolled in the College's undergraduate, graduate and minor programs, and (2) to provide support and breadth courses in science and mathematics for all students of the university. Cal Poly is a national leader in preparing college students for careers in science, technology, engineering, and mathematics (STEM) professions, including science and mathematics teaching careers.

The College of Science and Mathematics has a tradition and reputation for excellence in teaching and is dedicated to both undergraduate and graduate instruction. The College provides a student-centered learning environment consistent with the University's "learn by doing" philosophy. In laboratories, students have access to modern instrumentation and computer technology. Classroom instruction is done in relatively small classes so that a personal approach by instructors is possible. Because of the College's large role in offering support courses to the rest of the university community, the number of faculty in each department is relatively large and favors student-faculty interaction, both inside and outside of the classroom.

School of Education

The School of Education prepares students to be effective, ethical and informed teachers, counselors and administrators, who have a particular expertise relative to current state and national needs in their respective fields through an inquiry-focused clinical approach. The School of Education offers a range of programs: multiple subject and single subject teaching credentials; agriculture specialist credential; integrated credential and M.A. in Education with specializations in special education and educational leadership and administration; and M.A. in Education with specialization in counseling and guidance. Single subject credential programs are offered in Agriculture, English, Biology, Chemistry, Mathematics, Physics and Social Science.

To prepare students in these fields, faculty from agriculture, science, mathematics, and the liberal arts work collaboratively with faculty in the School of Education to provide outstanding programs that maintain a balance of coursework in subject matter, foundations of education, and pedagogy, integrated with field experiences for applied practice. In the Liberal Studies Program, students can pursue a pre-professional program that leads to a B.S. degree and includes preparation toward a multiple subject credential to teach in elementary school. Cal Poly takes pride in producing school teachers and leaders through a balanced curriculum. More information on the programs offered can be found in the School of Education (p. 386) section of this catalog.

CESaME

The University Center for Excellence in Science and Mathematics Education (CESaME) was created to focus Cal Poly on preschool through college (P-16) STEM education in order to improve the STEM education and workforce pipeline and to enhance the scientific and technological literacy of our citizens. As an interdisciplinary, university-wide endeavor, CESaME fosters collaborations among students, staff and faculty from across campus and nurtures partnerships with preschool through high school (P-12) teachers and community college faculty as well as business, industry, government and foundations in support of improving STEM learning and teacher education.

CESaME leads the state in the development and implementation of model programs in teacher education and professional development, such as the Science Teacher and Researcher (STAR) program that provides summer research internships for aspiring and early career science and mathematics teachers from any CSU campus. CESaME is responsible for Cal Poly's Math and Science Teacher Initiative and fosters other

programs such as Cal Poly's Noyce Scholarship program, the Learn By Doing Laboratory (a local P-16 STEM initiative) and various professional development programs for local science and mathematics teachers.

Student Services

The College Office acts on various student-initiated petitions (change of major, curriculum substitutions, withdrawal from the university). In addition, the office has the dual function of counseling those on academic probation and notifying those undergraduate students who are eligible each quarter for the Dean's Honor List.

Faculty Advising

Faculty members take an active role in academic and career advising. Students are encouraged to obtain academic advising prior to registration each quarter. The advisor-student relationship becomes important especially when the student needs a letter of reference for a potential employer or graduate school or needs career advice.

College of Science and Mathematics Advising Center

Science North (Bldg. 53), Room 211
Phone: 805.756.2615
<https://csmadvising.calpoly.edu>

Director/Advisor: Kristi Weddige
Advisor: Meghan Farrier-Nolan
Advisor: Anya Bergman
Advisor: Laura Wilson
Advisor: Tiffany Kwapnoski
Administrative Coordinator: Amber Vogt

The College of Science and Mathematics Advising Center provides academic advising services to students within the college. Professional advisors take a holistic approach to advising by helping students to define academic, career and personal goals, and empowering them to create an educational plan that is consistent with these goals. Services include assistance with developing long-range academic plans, interpreting university and college policy and procedures, articulation agreements, scheduling classes, and informing students of their graduation requirements, as well as academic peer coaching for students experiencing academic difficulty. In addition, the Advising Center provides pre-health career advising services and resources for students seeking a career in a health professions field upon graduation. For more information, please refer to: pre-health career advising (p. 422). Students are encouraged to seek advice early and often throughout their time at Cal Poly.

Applying to Graduate School

College of Science and Mathematics faculty have earned advanced degrees from a wide variety of universities and are excellent sources for information and advice about graduate programs, prerequisites and application procedures. Applications to graduate programs should be made in the fall for admission to the following fall term. The Graduate Record Exam (GRE) should be taken early in the application cycle. Generally, two or more letters of reference from faculty are required. Most Ph.D. granting institutions offer financial support in the form of teaching assistantships and research fellowships.

Interdisciplinary Minors Actuarial Preparation Minor

Actuaries are professional risk managers that assess the likelihood and impact of future, uncertain events. They use their quantitative skills to prepare businesses for the financial impact of the risk to which they are exposed. Actuaries must meet rigorous standards for admission to professional societies. To be called an actuary in the United States, one must become an Associate or Fellow of the Society of Actuaries (SOA) or the Casualty Actuarial Society (CAS).

The Actuarial Preparation Minor provides education in probability, financial mathematics, and mathematical statistics. The coursework will satisfy the Validation by Educational Experience (VEE) requirements of the SOA and CAS, and will help students prepare for the actuarial exams, which are also prerequisite to SOA or CAS membership.

The minor is open to any major, but it is especially suited to students in statistics, mathematics, and business/finance. Students interested in the minor should consult the website <https://statistics.calpoly.edu/content/actuary>.

Additional information about the actuarial profession, societies, and exams, as well as additional suggested coursework, is available at the website above.

Biotechnology Minor

Biotechnology is one of the most important areas of growth in the biomedical sciences and has transformed medicine, chemical manufacturing, and agriculture over the last 20 years. Cal Poly's Biotechnology minor is designed to give undergraduate students a grounding in the sciences that underlie biotechnology; in addition, students engage in practical experience in biotechnology lab work.

Students completing the Biotechnology minor take a core of required courses and approved elective courses focusing on biotechnology. The Biotechnology Minor Form is available from the Dean's Office or the Advising Center in the College of Science and Mathematics. Final approval of the minor is by one of the Minor Coordinators in the College of Science and Mathematics.

The minor is open to any major except Biochemistry, Microbiology, and Biological Science General Curriculum or with concentrations in Anatomy and Physiology, and Molecular and Cellular Biology.

Biological Sciences students preparing for the minor should take CHEM 216, CHEM 217, and CHEM 371 to fulfill the organic chemistry and biochemistry (if applicable) requirements of their major.

Students interested in more information should contact the Biotechnology Minor Coordinators in the Chemistry and Biochemistry Department or the Biological Sciences Department.

Environmental Studies Minor

Students who complete a minor in Environmental Studies will be able to:

- Analyze, explain, and evaluate environmental issues from both scientific/technical and social/political/economic/ethical perspectives.
- Integrate and synthesize knowledge from multiple disciplines.

- Explain and apply the methodologies and approaches that different disciplines bring to bear on complex problems.
- Work productively and effectively with students from other disciplines and with other points of view.
- Confront and grapple with real issues of contemporary significance.
- Gain employment or pursue further study that emphasizes interdisciplinary knowledge and skills.

More information about the Environmental Studies Minor, including Subject Area Electives appropriate for students in each of the colleges, can be obtained from the College of Science and Math Advising Center in Building 53, Room 211.

Actuarial Preparation Minor

Required Courses (Validation by Educational Experience)

BUS 342	Fundamentals of Corporate Finance	4
ECON 221	Microeconomics	4
ECON 222	Macroeconomics	4
STAT 324	Applied Regression Analysis	4
or STAT 334	Applied Linear Models	
STAT 416	Statistical Analysis of Time Series	4
or ECON 406	Applied Forecasting	

Approved Electives

BUS 431	Security Analysis and Portfolio Management	4
or BUS 439	Fixed Income Securities Market	
STAT 305	Introduction to Probability and Simulation	4
or STAT 425	Probability Theory	

Total units 28

Biotechnology Minor

Required Courses

BIO/CHEM 202	Orientation to Biotechnology	2
Select from the following:		4-5

BIO 161	Introduction to Cell and Molecular Biology	
BOT 121	General Botany	
MCRO 221	Microbiology	
MCRO 224	General Microbiology I	

Select from the following: 3-5

BIO 303	Survey of Genetics	
BIO 351	Principles of Genetics	
CHEM 373	Molecular Biology	

Select from the following: 5

CHEM 313	Survey of Biochemistry and Biotechnology	
CHEM 371	Biochemical Principles	

Laboratory elective- select from the following: 3-5

ASCI 403	Applied Biotechnology in Animal Science	
BIO/CHEM 475	Molecular Biology Laboratory	
CHEM 474	Protein Techniques Laboratory	

Approved Electives

Select from the following: 6-11

Animal Biotechnology

ASCI 403	Applied Biotechnology in Animal Science	
ASCI 406	Applied Animal Embryology and Assisted Reproduction	
ASCI 440	Immunology and Diseases of Animals	
ASCI 503	Advanced Molecular Techniques in Animal Science	
DSCI 330	Artificial Insemination and Embryo Biotechnology	

Bioinformatics

BIO/CHEM 441	Bioinformatics Applications	
CSC 448	Bioinformatics Algorithms	

Cell and Molecular Biology/Microbial Biotechnology

BIO 426	Immunology	
BIO 452	Cell Biology	
BIO/CHEM 475	Molecular Biology Laboratory	
BIO 476	Gene Expression Laboratory	
CHEM 474	Protein Techniques Laboratory	
CHEM 528	Nutritional Biochemistry	
MCRO 225	General Microbiology II	
MCRO 320	Emerging Infectious Diseases	
MCRO 402	General Virology	
MCRO 433	Microbial Biotechnology	

Engineering-related Biotechnology

BRAE 448	Bioconversion	
ENGR 581	Biochemical Engineering	
ENVE 443	Bioremediation Engineering	

Ethics

PHIL 339	Biomedical Ethics	
or PHIL 341	Professional Ethics	
or SCM 451	Ethics in the Sciences	

Pharmaceutical Biotechnology

CHEM 377	Chemistry of Drugs and Poisons	
CHEM 477	Biochemical Pharmacology	

Plant Biotechnology

BOT 323	Plant Pathology	
---------	-----------------	--

Total units 28

Environmental Studies Minor

Select one course from each subject area. Electives must be approved in advance by an advisor for the minor.

Biology and ecology

Select from the following: 4

BIO 112	Environmental Biology and Conservation	
BIO 227	Wildlife Conservation Biology	
BIO 327	Wildlife Ecology	
BIO 401	Principles of Conservation Biology	

NR 306	Natural Resource Ecology and Habitat Management	
Earth science		
Select from the following:		3-4
ERSC 144	Introduction to Earth Science	
GEOG 250	Physical Geography	
GEOL 102	Introduction to Geology	
PHYS 107	Introduction to Meteorology	
PHYS 313	Introduction to Atmospheric Physics	
PSC 201	Physical Oceanography	
Energy and pollution		
Select from the following:		3-4
BRAE 348	Energy for a Sustainable Society	
CHEM 341	Environmental Chemistry: Water Pollution	
ENVE 324	Introduction to Air Pollution	
ENVE 331	Introduction to Environmental Engineering	
PHYS 310	Physics of Energy	
PSC 320	Energy, Society and the Environment	
Social, political, economic, and ethical issues		
Select from the following:		3-4
CRP 404	Environmental Law	
ECON 431	Environmental Economics	
GEOG 325	Climate and Humanity	
ISLA 303	Values and Technology	
PHIL 340	Environmental Ethics	
POLS/UNIV 333	World Food Systems	
RPTA 302	Environmental and Wilderness Education	
Environmental planning, management, and sustainability		
Select from the following:		3-4
AG 315	Organic Crop Production	
AG/ISLA/UNIV 330	Cal Poly Land: Nature, Technology, and Society	
AG 360	Holistic Management	
ASCI 329	Principles of Range Management	
CRP 336	Introduction to Environmental Planning	
EDES 406	Sustainable Environments	
ERSC/GEOG 333	Human Impact on the Earth	
GEOG 301	Geography of Resource Utilization	
NR 142	Environmental Management	
RPTA 313	Sustainability in the Experience Industry	
Approved Elective		
Choose one additional 300-400 level course from the above lists.		4
Capstone Course		
AG/EDES/ENGR/ISLA/SCM/UNIV 350	The Global Environment	4
Total units		24-28

Biological Sciences

Fisher Science Hall (33), Room 273

Phone: 805.756.2788

Email: biosci@calpoly.edu

<https://bio.calpoly.edu>

Department Chair: Ken Hillers

Academic Programs

Program name	Program type
Biological Sciences	BS, MA, MS
Biology	Minor
Marine Sciences	BS
Microbiology	BS, Minor

The department offers several undergraduate programs leading to Bachelor of Science degrees in Biological Sciences, Marine Sciences and Microbiology, and minors in Biology and Microbiology. For qualified students, a graduate program is available leading to a Master of Science or a Master of Arts degree. In addition, courses are offered to satisfy biology requirements in academic majors across campus.

The Biological Sciences department teaches courses with the following prefixes: BIO (Biology), BOT (Botany), MCRO (Microbiology), and MSCI (Marine Science).

The department is housed in modern facilities equipped with up-to-date instrumentation. Cal Poly's geographical setting offers unusual opportunities for studying representative plants and animals of both Northern and Southern California. Graduates of the various programs enter fields in teaching; laboratory technology; public health; biotechnology research and manufacturing; wildlife management; consulting; agriculture; industry; and private, state, and national park and forest services. A significant number of graduates enter graduate or professional schools for advanced study of botany, ecology, entomology, microbiology, plant pathology, zoology, marine sciences, veterinary science, cell and molecular biology, medicine, and dentistry. The department offers courses required for preprofessional training in medicine and paramedical fields.

Students majoring in Biological Sciences, Marine Sciences, or Microbiology may take advantage of opportunities to participate in research projects. Special opportunities are available through the Center for Applications in Biotechnology (CAB) that is developing biological tools to address environmental concerns through collaborative interdisciplinary research and education; the Center for Coastal Marine Science (CCMS) that promotes and facilitates basic and applied studies of coastal marine systems for the purposes of addressing environmental concerns and fostering hands-on learning through discovery and outreach; and the Undergraduate Biotechnology Laboratory (UBL), which is co-funded by Cal Poly and the National Science Foundation to provide undergraduates with hands-on experience with biotechnology. In addition, there are a large number of opportunities to work in the laboratory of individual faculty members in areas such as conservation, genetics and genomics, botany, ecology, endangered species, infectious disease mechanisms, developmental biology, anatomy, and physiology.

The department supports the concept of international education and encourages students to investigate opportunities for overseas study. For further information, see Cal Poly International Center (p. 419).

Undergraduate Programs BS Biological Sciences

The degree offers students a broad education in biology from molecules to ecosystems, with an emphasis on hands-on training in the laboratory and the field. Biology majors can gain preprofessional preparation in the biomedical fields, coursework toward a teaching credential, progress toward professional certification, and/or preparation for graduate training in a field of interest. In addition to the core coursework for the biology major, students may choose a concentration in order to gain a deep, focused understanding of a specific subfield within biology, or may follow the general curriculum in biology for broader exposure to a variety of topics. Students are encouraged to consult with a faculty advisor and the College of Science and Mathematics Advising Center to help them learn about their chosen degree program, concentration choices, career options, study skills, and departmental opportunities. Students interested in teaching may choose any concentration and should contact the single subject credential advisor for information about teaching opportunities and recommended coursework. Students may not double major in Biological Science and Microbiology. Students may not double major in Biological Science and Marine Science.

Concentrations

Anatomy and Physiology

Students in this concentration study biological sciences with an emphasis on the structure and function of humans and other animals. This concentration is ideal for students preparing for careers in the health professions.

Ecology

The study of ecology spans a wide breadth of habitats, from terrestrial to marine, and multiple scales of organization, from microbial interactions to global processes. As such, the ecology concentration allows flexibility for students to design a program to fit their interests and career goals within this broad discipline. The concentration emphasizes collection and analysis of data to better understand the factors that affect the distribution and abundance of organisms. In many contexts, these results are used to identify and solve environmental problems. Graduates may pursue careers in education, ecological consulting, planning or coordination, habitat restoration, or environmental law. A graduate may be academically qualified for professional certification as an Associate Ecologist by the Ecological Society of America.

Molecular and Cellular Biology

Designed for students who are interested in how genes and their products work to create and maintain cells, tissues and organisms. This concentration augments the diverse biological sciences curriculum with laboratory courses in nucleic acid and protein techniques, along with cell biology, biochemistry, and electives such as bioinformatics, microbial biotechnology, immunology, developmental biology and virology. This concentration is ideal for students interested in biotechnology or biomedical research, and is also an excellent option for students planning future studies in the health professions.

Wildlife and Biodiversity Conservation

The is to prepare students in the skills necessary to participate in the conservation of wildlife, plants, and other wild species and their habitats. Professions in this arena include N.G.O., state and federal resource management agencies, private consulting firms, and research. These professions require a solid foundation in the identification of wild species, the principles of ecology, and the tools, policies and social context of conservation. This area of concentration may help students

meet the requirements for professional certification established by off-campus entities such as The Wildlife Society and the Ecological Society of America; students interested in such certification programs should consult with their faculty advisor for specific programmatic guidance.

General Curriculum in Biology

General Curriculum in Biology is not a concentration but can be used to fulfill the unit requirements of a concentration. The General Curriculum provides the greatest flexibility allowing students to take coursework across all areas of biology. This breadth of knowledge across the biological sciences may be especially beneficial for students considering teaching biology at the secondary level. Students who do not declare a concentration will default to the General Curriculum.

BS Marine Sciences

The degree is an integrative program designed to prepare students for advanced training or professional employment in public or private agencies concerned with marine-related issues. While this degree is based in Biological Sciences, the program includes faculty from other disciplines including chemistry, physics, mathematics, engineering, and computer science. The degree instills students with critical thinking and analytical skills in areas such as marine organism physiology, conservation, fisheries, oceanographic sampling and data networks. Through the use of experience-based learning including faculty-led research projects, students will develop essential knowledge as well as a solid foundation in community-oriented education in the interdisciplinary field of marine sciences. Students may not double major in Biological Science and Marine Science.

BS Microbiology

Microbiology is the study of bacteria, viruses, fungi, and protists. Microorganisms are ubiquitous in the environment as important contributors to nutrient cycling, and many have symbiotic relationships with other organisms. Species of medical importance impact human and animal health as pathogens associated with infectious diseases. Additionally, microorganisms are critical research tools in fields such as molecular biology and genetics, and are used for large-scale production of many foods, pharmaceuticals, and industrial chemicals. Cal Poly is one of the few public universities in California offering a laboratory-intensive Bachelor of Science degree in Microbiology.

In the junior and senior years, majors take specialized courses in medical microbiology, immunology, microbial physiology, genetics, virology, and cell biology. Students also choose elective courses related to student interests and career goals in close consultation with their faculty advisor. Such goals may include graduate school or professional studies with further training through Clinical Laboratory Scientist (CLS) or Public Health Microbiologist certification programs. Graduates may also pursue post-baccalaureate employment in applied areas such as industrial microbiology, food and dairy microbiology, biotechnology, public health, epidemiology, or medical laboratory technology. Students may not double major in Biological Science and Microbiology.

Biology Minor

The purpose of the minor is to help students from other disciplines acquire increased factual and conceptual knowledge in biology, an increased understanding of scientific methods and techniques used to

study biology, and an increased ability to analyze biological topics in the news or in various jobs. Biological issues are important throughout modern life and particularly relevant in many careers, including those in health-related businesses, agriculture, several engineering disciplines, city planning, teaching K-12 students, journalism, political science, psychology, and statistics. Students in more closely related majors such as biochemistry or kinesiology may also be interested in strengthening their biology background. In addition, an enhanced biology background helps students become better educated citizens regarding a variety of controversial issues in modern society (e.g., genetically-modified organisms in agriculture, human cloning, genetic discrimination, the pressures of population growth). The minor is open to any major except Biological Science, Marine Science and Microbiology.

Biotechnology Minor

For information regarding the Biotechnology Minor, please see College of Science and Mathematics (p. 336) section.

Microbiology Minor

This minor is designed to give students, from majors in which microbiology may be an important component, increased exposure to factual information, concepts, and skills and to provide those students a more complete understanding of the roles of microorganisms as they pertain to their major. Students in the allied health and related fields may expand their breadth of knowledge in microbial diseases, transmission and prevention, and immunologic responses. Students in applied fields of study such as Food and Dairy Sciences and various aspects of agriculture can gain additional information in pertinent topics such as the presence and role of microorganisms in water and wastewater treatment, in recycling of nutrients and soil fertility, in food processing, spoilage, and production, and in disease transmission. The minor is open to any major except Biological Science.

Graduate Programs

Master of Arts Degree in Biological Sciences

NOTE: Applications for Fall 2018 admission to the MA Biological Sciences program are not currently being accepted. Contact the Biological Sciences department for further information.

General Characteristics

This degree offers a broad background in the biological sciences. The program is designed to offer sufficient breadth and depth to strengthen the student's academic understanding and improve competence for:

1. many types of biological work that require advanced training beyond the bachelor's degree;
2. careers in industry and/or civil service;
3. teaching biological sciences at the elementary, secondary, and community college levels.

This degree differs from the MS in Biological Sciences in that a research thesis is not required.

Prerequisites

Admission to this program requires a minimum grade point average of 3.0 in the last 90 quarter units attempted, submission of satisfactory

scores on the Graduate Record Examination (GRE), and two letters of recommendation from persons knowing your academic potential.

Advancement to candidacy requires a satisfactory background in biology, and completion of 12 units of courses specified in an informal study plan with a minimum grade point average of 3.0. Information pertaining to specific departmental requirements for admission classified or conditionally classified may be obtained from the Director of the Graduate and Research Committee (Graduate Coordinator) of the Biological Sciences Department.

Program of Study

The formal program of study for the degree must include 45 units of committee-approved graduate work, at least 30 units of which must be at the 500 level. A grade point average of 3.0 or better is required from the combination of all courses included in the Formal Study Plan. Coursework must include 32 units within the Biological Sciences Department at Cal Poly. Only 4 units of BIO 575 College Teaching Practicum can be used; a maximum of 3 units of BIO 590 Seminar in Biology can be used in the Formal Study Plan. The culminating experience is a comprehensive written exam covering three areas of biology.

Master of Science Degree in Biological Sciences

General Characteristics

This degree offers a broad background in the biological sciences. The program is designed to offer sufficient breadth and depth to strengthen the student's academic understanding and improve competence for:

1. many types of biological work that require advanced training beyond the bachelor's degree;
2. careers in industry and/or civil service;
3. teaching biological sciences at the elementary, secondary, and community college levels;
4. independent research in the field of specialization;
5. continued graduate work at other institutions.

Prerequisites

Admission to this program requires a minimum grade point average of 3.0 in the last 90 quarter units attempted, submission of satisfactory Graduate Record Examination (GRE) scores, and two letters of recommendation from persons knowing your academic potential.

Information pertaining to specific departmental requirements for admission, classified, or conditionally classified may be obtained from the Director of the Graduate and Research Committee (Graduate Coordinator) of the Biological Sciences Department.

Program of Study

The formal program of study for the degree must include 45 units of committee-approved graduate work, at least 30 units of which must be at the 500 level. Coursework must include 32 units taken within the Biological Sciences Department at Cal Poly. A grade point average of 3.0 or better is required from the combination of all courses included in the Formal Study Plan. A maximum of 3 units of BIO 590 Seminar in Biology, and a maximum of 3 units of BIO 500 Individual Study may be used as credit towards the degree. The culminating experience is a written and

publicly presented independent and novel body of research, and nine units of BIO 599 Thesis.

MS Biological Sciences, Specialization in Regenerative Medicine

Characteristics. Prepares students for careers in regenerative medicine and related fields. Specifically, our graduates are prepared for immediate employment in regenerative medicine, biotechnology or medical technology companies, or as research specialists/laboratory managers at universities and research institutes. Program graduates are also well-prepared to matriculate into biological sciences doctoral programs or graduate programs in the health professions.

Culminating Experience. Students who obtain a degree in the Master of Science in Biological Sciences with a specialization in Regenerative Medicine are not required to complete the GRE Advanced Biology exam or BIO 599. In place of the thesis as a culminating experience, students are required to complete a non-traditional Comprehensive Exam. This non-traditional Comprehensive Exam includes a 9-month internship at a company or academic research laboratory (BIO 593), a quarter-long project course at Cal Poly (BIO 594), a written report and oral presentation of the internship project, and a written report and oral presentation of the final quarter-long project. Through the completion of these components, students demonstrate their ability to integrate the knowledge of the area, show critical and independent thinking, and demonstrate mastery of the subject matter.

BS Biological Sciences

Program Learning Objectives

1. Students will demonstrate a writing style appropriate for communicating scientific results to a diverse audience.
2. Students will integrate math, physical sciences and technology to answer biological questions using the scientific method.
3. Students will demonstrate proficiency of lab and field techniques in their area of specialization.
4. Students will master and retain fundamental concepts in biology (atom to ecosystem).
5. Students will demonstrate the skill to assess and analyze data with objectivity.
6. Students will demonstrate proficiency in searching, reading and evaluating the scientific literature.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

BIO 160

Diversity and History of Life

BIO 161	Introduction to Cell and Molecular Biology (B2&B4) ¹	4
BIO 162	Introduction to Organismal Form and Function	4
BIO 263	Introductory Ecology and Evolution	4
BIO 351	Principles of Genetics	5
BIO 414	Evolution	4
BIO 461	Senior Project - Research Proposal	2
or BIO 462	Senior Project - Research	
Ecology ²		
Select from the following:		4
BIO 327	Wildlife Ecology	
BIO 401	Principles of Conservation Biology	
BIO 442	Behavioral Ecology	
BOT 326	Plant Ecology	
MCRO 436	Microbial Ecology	
MSCI 328	Marine Ecology	
Physiology ³		
Select from the following:		4
BIO 361	Principles of Animal Physiology	
BIO 434	Environmental Physiology	
BIO 435	Plant Physiology	
Concentration or General Curriculum in Biology ^{4,5}		
(See list of Concentrations and General Curriculum in Biology below)		43
SUPPORT COURSES		
CHEM 127	General Chemistry for Agriculture and Life Science I (B3&B4) ¹	4
CHEM 128	General Chemistry for Agriculture and Life Science II	4
CHEM 129	General Chemistry for Agriculture and Life Science III	4
CHEM 216	Organic Chemistry I ⁵	5
or CHEM 312	Survey of Organic Chemistry	
MATH 161	Calculus for the Life Sciences I (B1) ¹	4
MATH 162	Calculus for the Life Sciences II (B1) ¹	4
PHYS 121	College Physics I	4
PHYS 122	College Physics II	4
PHYS 123	College Physics III	4
STAT 218	Applied Statistics for the Life Sciences	4
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		56
FREE ELECTIVES		
Free Electives		5
Total units		180

¹ Required in Major/Support; also satisfies GE.

² Students in the Wildlife and Biodiversity Concentration should take either BIO 327 or BOT 326 to fulfill this requirement.

³ Students planning to take Anatomy and Physiology courses should take BIO 361 to fulfill this requirement.

⁴ Courses taken to meet a major or support requirement cannot be double-counted in the concentration or general curriculum.

⁵ Students in the Molecular and Cellular Biology concentration should take CHEM 216 to fulfill this requirement.

General Curriculum in Biology or Concentrations (Select one)

- General Curriculum in Biology (p. 343)
- Anatomy and Physiology (p. 345)
- Ecology (p. 346)
- Molecular and Cellular Biology (p. 348)
- Wildlife and Biodiversity Conservation (p. 348)

General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Major) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course (in Major) ¹	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		56

¹ Required in Major/Support; also satisfies GE.

General Curriculum in Biology

The General Curriculum in Biology is followed by default if no concentration is declared.

Biodiversity Courses ^{1,2}

Select from the following:	4
----------------------------	---

BIO 321	Mammalogy	
BIO 322	Ichthyology	
BIO 323	Ornithology	
BIO 324	Herpetology	
BIO 329	Vertebrate Field Zoology	
BIO 335	General Entomology	
BIO 336	Invertebrate Zoology	
BIO 429	Parasitology	
BOT 313	Taxonomy of Vascular Plants	
MCRO 224	General Microbiology I ⁵	
MCRO 402	General Virology	
MSCI 324	Marine Mammals, Birds and Reptiles	
300-400 level Electives ^{1,2}		
Select from any 300-400 level BIO/BOT/MCRO/MSCI course, except BIO 330, BIO 400, BIO 450, BIO 461, BIO 462, BIO 463, BIO 470, BIO 471, BIO 472.		9
400-level Electives ^{1,2}		
Select from any 400 level BIO/BOT/MCRO/MSCI course, except BIO 400, BIO 450, BIO 461, BIO 462, BIO 463, BIO 470, BIO 471, BIO 472.		11
Approved Electives ^{2,3,4}		
At least 12 units must be upper-division.		
At least 4 units must be BIO/BOT/MCRO/MSCI course(s)		
Select from the following:		19
Any BIO/BOT/MCRO/MSCI course ⁶		
AG/EDES/ENGR/ The Global Environment ISLA/SCM/UNIV 350		
ANT 401	Culture and Health	
ASCI 329	Principles of Range Management	
ASCI 351	Reproductive Physiology	
ASCI 403	Applied Biotechnology in Animal Science	
ASCI 405 or BIO 407	Domestic Livestock Endocrinology Advanced Anatomy and Physiology: Endocrinology	
ASCI 406	Applied Animal Embryology and Assisted Reproduction	
ASCI 438	Systemic Animal Physiology	
ASCI 503	Advanced Molecular Techniques in Animal Science	
CHEM 217	Organic Chemistry II	
CHEM 218	Organic Chemistry III	
CHEM 220	Organic Chemistry Laboratory For Life Sciences II	
CHEM 223	Organic Chemistry Laboratory for Life Sciences III	
CHEM 313 or CHEM 371	Survey of Biochemistry and Biotechnology Biochemical Principles	
CHEM 331	Quantitative Analysis	
CHEM 341	Environmental Chemistry: Water Pollution	
CHEM 372	Metabolism	
CHEM 377	Chemistry of Drugs and Poisons	

CHEM 418	Neurochemistry
CHEM 474	Protein Techniques Laboratory
CHEM 528	Nutritional Biochemistry
COMS 418	Health Communication
ENGR 322/ SCM 302	The Learn By Doing Lab Teaching Practicum
ERSC/GEOG 250	Physical Geography
ES/WGS 350	Gender, Race, Culture, Science and Technology
FSN 310	Maternal and Child Nutrition
FSN 429	Clinical Nutrition I
GEOG 440	Advanced-Applications in GIS
KINE 406	Neuroanatomy
KINE 445	Electrocardiography
KINE 446	Echocardiography
LA/NR 218 or GEOG 318	Applications in GIS Applications in GIS
NR 141	Introduction to Forest Ecosystem Management
NR 142	Environmental Management
NR 404	Environmental Law
NR 416	Environmental Impact Analysis and Management
NR 418	Applied GIS
NR 425	Applied Resource Analysis and Assessment
PHIL 339 or PHIL 341 or SCM 451	Biomedical Ethics Professional Ethics Ethics in the Sciences
PSC 201	Physical Oceanography
PSY 320	Health Psychology
PSY 340	Biopsychology
SS 121	Introductory Soil Science
SS 321	Soil Morphology
SS 322	Soil Plant Relationships
SS 422	Soil Ecology
STAT 313	Applied Experimental Design and Regression Models
STAT 324 or STAT 334	Applied Regression Analysis Applied Linear Models
STAT 330	Statistical Computing with SAS
STAT 416	Statistical Analysis of Time Series
STAT 419	Applied Multivariate Statistics
STAT 421	Survey Sampling and Methodology

Total units 43

¹ Excess units will be applied to subsequent concentration Electives.

² Consultation with advisor is recommended prior to selecting electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

³ Courses taken to meet a major or support requirement cannot be double-counted as an elective.

⁴ Selecting a GE Area F course that double counts as an elective may cause an upper-division unit shortage. Take care to ensure that you have selected enough 300 and 400-level courses to meet the 60-unit Upper-Division Requirement.

⁵ Recommended for students interested in health science careers.

⁶ Maximum of 6 units may be applied toward Approved Electives from "by arrangement" courses: BIO 330, BIO 400, BIO 450, BIO 461, BIO 462, BIO 463, BIO 470, BIO 471, BIO 472, ENGR 322/SCM 302.

Anatomy and Physiology Concentration

BIO 452	Cell Biology	4
---------	--------------	---

CHEM 371	Biochemical Principles	5
or CHEM 313	Survey of Biochemistry and Biotechnology	

Biodiversity Courses^{1,2}

Select from the following:	4
----------------------------	---

AEPS/BOT 323	Plant Pathology
BIO 321	Mammalogy
BIO 322	Ichthyology
BIO 323	Ornithology
BIO 324	Herpetology
BIO 329	Vertebrate Field Zoology
BIO 335	General Entomology
BIO 336	Invertebrate Zoology
BIO 415	Biogeography
BOT 313	Taxonomy of Vascular Plants
MCRO 224	General Microbiology I ³
MSCI 324	Marine Mammals, Birds and Reptiles
MSCI 437	Marine Botany

Core Anatomy and Physiology Courses^{1,2}

Select from the following:	16
----------------------------	----

BIO 406	Advanced Anatomy and Physiology: Neuroscience
BIO 407	Advanced Anatomy and Physiology: Endocrinology
or ASCI 405	Domestic Livestock Endocrinology
BIO 408	Advanced Anatomy and Physiology: Cardiorespiratory and Renal
BIO 409	Advanced Anatomy and Physiology: Muscle and Locomotion
BIO 410	Functional Histology
BIO 426	Immunology

Department Electives^{1,2}

Select from the following:	3
----------------------------	---

BIO 321	Mammalogy
BIO 322	Ichthyology
BIO 323	Ornithology
BIO 324	Herpetology
BIO 329	Vertebrate Field Zoology
BIO 335	General Entomology
BIO 336	Invertebrate Zoology
BIO 405	Developmental Biology

BIO 406	Advanced Anatomy and Physiology: Neuroscience
BIO 407	Advanced Anatomy and Physiology: Endocrinology
or ASCI 405	Domestic Livestock Endocrinology
BIO 408	Advanced Anatomy and Physiology: Cardiorespiratory and Renal
BIO 409	Advanced Anatomy and Physiology: Muscle and Locomotion
BIO 410	Functional Histology
BIO 415	Biogeography
BIO 426	Immunology
BIO 428	Hematology
BIO 429	Parasitology
BIO 434	Environmental Physiology
BIO 435	Plant Physiology
BIO 470	Selected Advanced Topics (for "Gastrointestinal Physiology & Microbiology" topic only)
BIO/CHEM 475	Molecular Biology Laboratory
MCRO 224	General Microbiology I ³
MCRO 225	General Microbiology II
MCRO 320	Emerging Infectious Diseases
MCRO 342	Public Health Microbiology
MCRO 402	General Virology
MCRO 423	Medical Microbiology
MCRO 424	Microbial Physiology

Approved Electives²

Select from the following:	11
----------------------------	----

AEPS/BOT 323	Plant Pathology
ANT 401	Culture and Health
ASCI 351	Reproductive Physiology
ASCI 406	Applied Animal Embryology and Assisted Reproduction
ASCI 438	Systemic Animal Physiology
BIO 321	Mammalogy
BIO 322	Ichthyology
BIO 323	Ornithology
BIO 324	Herpetology
BIO 329	Vertebrate Field Zoology
BIO 335	General Entomology
BIO 336	Invertebrate Zoology
BIO 400	Special Problems for Advanced Undergraduates ⁵
BIO 405	Developmental Biology
BIO 406	Advanced Anatomy and Physiology: Neuroscience
BIO 407	Advanced Anatomy and Physiology: Endocrinology
or ASCI 405	Domestic Livestock Endocrinology
BIO 408	Advanced Anatomy and Physiology: Cardiorespiratory and Renal
BIO 409	Advanced Anatomy and Physiology: Muscle and Locomotion

BIO 410	Functional Histology
BIO 415	Biogeography
BIO 426	Immunology
BIO 428	Hematology
BIO 429	Parasitology
BIO 434	Environmental Physiology
BIO 435	Plant Physiology
BIO 461	Senior Project - Research Proposal ^{4, 5}
BIO 462	Senior Project - Research ^{4, 5}
BIO 463	Honors Research ⁵
BIO 470	Selected Advanced Topics (for "Gastrointestinal Physiology & Microbiology" topic only)
BIO/CHEM 475	Molecular Biology Laboratory
BOT 313	Taxonomy of Vascular Plants
CHEM 217	Organic Chemistry II
CHEM 218	Organic Chemistry III
CHEM 220	Organic Chemistry Laboratory For Life Sciences II
CHEM 223	Organic Chemistry Laboratory for Life Sciences III
CHEM 372	Metabolism
CHEM 418	Neurochemistry
COMS 418	Health Communication
ENGR 322/ SCM 302	The Learn By Doing Lab Teaching Practicum ⁵
FSN 310	Maternal and Child Nutrition
FSN 429	Clinical Nutrition I
KINE 406	Neuroanatomy
KINE 445	Electrocardiography
KINE 446	Echocardiography
MCRO 225	General Microbiology II
MCRO 320	Emerging Infectious Diseases
MCRO 342	Public Health Microbiology
MCRO 402	General Virology
MCRO 423	Medical Microbiology
MCRO 424	Microbial Physiology
MSCI 324	Marine Mammals, Birds and Reptiles
MSCI 437	Marine Botany
PHIL 339 or PHIL 341 or SCM 451	Biomedical Ethics Professional Ethics Ethics in the Sciences
PSY 320	Health Psychology
PSY 340	Biopsychology
WGS/ES 350	Gender, Race, Culture, Science and Technology
Total units 43	

¹ Excess units will be applied to subsequent concentration Electives.

² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

³ Recommended for students interested in health sciences careers.

⁴ If BIO 461 or BIO 462 is used to meet the Senior Project Requirement, it cannot also be counted as an Approved Elective.

⁵ Maximum of 6 units may be applied toward Approved Electives from "by arrangement" courses: BIO 400, BIO 461, BIO 462, BIO 463, ENGR 322/SCM 302.

Ecology Concentration

Ecology Levels ¹

Select from the following: 12

BIO 442 Behavioral Ecology

BIO 444 Population Ecology

BIO 445 Community Ecology

BIO 446 Ecosystem Ecology

Systems and Applications ¹

Select from the following: 12

BIO 327 Wildlife Ecology

BIO 401 Principles of Conservation Biology

BIO 415 Biogeography

BOT 326 Plant Ecology

MSCI 328 Marine Ecology

Biodiversity Courses ¹

Select from the following: 4

BIO 321 Mammalogy

BIO 322 Ichthyology

BIO 323 Ornithology

BIO 324 Herpetology

BIO 329 Vertebrate Field Zoology

BIO 335 General Entomology

BIO 336 Invertebrate Zoology

BIO 429 Parasitology

BOT 313 Taxonomy of Vascular Plants

MCRO 224 General Microbiology I ⁶

MSCI 437 Marine Botany

Ecology Electives ^{1,2,3,4}

Select from the following: 7

BIO 321 Mammalogy

BIO 322 Ichthyology

BIO 323 Ornithology

BIO 324 Herpetology

BIO 327 Wildlife Ecology

BIO 329 Vertebrate Field Zoology

BIO 330 Extended Field Biology Activity

BIO 335 General Entomology

BIO 336 Invertebrate Zoology

BIO 361 Principles of Animal Physiology

BIO 400 Special Problems for Advanced Undergraduates

BIO 401 Principles of Conservation Biology

BIO 415 Biogeography

BIO 419 Analytical Methods in Ecology

BIO/NR/SS 421 Wetlands

BIO 427 Wildlife Management

BIO 429	Parasitology
BIO 434	Environmental Physiology
BIO 435	Plant Physiology
BIO/CHEM 441	Bioinformatics Applications
BIO 442	Behavioral Ecology
BIO 444	Population Ecology
BIO 445	Community Ecology
BIO 446	Ecosystem Ecology
BIO 461	Senior Project - Research Proposal
BIO 462	Senior Project - Research
BIO 463	Honors Research
BIO 472	Current Topics in Biological Research
BIO/CHEM 475	Molecular Biology Laboratory
BOT 311	Plants, People and Civilization
BOT 313	Taxonomy of Vascular Plants
BOT 326	Plant Ecology
BOT 433	Field Botany: California Plant Diversity
MCRO 224	General Microbiology I ⁶
MCRO 424	Microbial Physiology
MCRO 436	Microbial Ecology
MSCI 328	Marine Ecology
MSCI 437	Marine Botany
MSCI 439	Fisheries Science and Resource Management
MSCI 440	Communicating Ocean Sciences to Informal Audiences
Approved Electives ^{2, 3}	
Select from the following:	
AG/EDES/ENGR/ The Global Environment	
GEOG/ISLA/	
SCM/UNIV 350	
BIO 321	Mammalogy
BIO 322	Ichthyology
BIO 323	Ornithology
BIO 324	Herpetology
BIO 327	Wildlife Ecology
BIO 329	Vertebrate Field Zoology
BIO 330	Extended Field Biology Activity
BIO 335	General Entomology
BIO 336	Invertebrate Zoology
BIO 361	Principles of Animal Physiology
BIO 400	Special Problems for Advanced Undergraduates ⁵
BIO 401	Principles of Conservation Biology
BIO 415	Biogeography
BIO 419	Analytical Methods in Ecology
BIO/NR/SS 421	Wetlands
BIO 427	Wildlife Management
BIO 429	Parasitology
BIO 434	Environmental Physiology
BIO 435	Plant Physiology
BIO/CHEM 441	Bioinformatics Applications

BIO 442	Behavioral Ecology
BIO 444	Population Ecology
BIO 445	Community Ecology
BIO 446	Ecosystem Ecology
BIO 461	Senior Project - Research Proposal ^{4, 5}
BIO 462	Senior Project - Research ^{4, 5}
BIO 463	Honors Research ⁵
BIO 472	Current Topics in Biological Research ⁵
BIO/CHEM 475	Molecular Biology Laboratory
BOT 311	Plants, People and Civilization
BOT 313	Taxonomy of Vascular Plants
BOT 326	Plant Ecology
BOT 433	Field Botany: California Plant Diversity
ENGR 322/ SCM 302	The Learn By Doing Lab Teaching Practicum ⁵
ERSC/GEOG 250	Physical Geography
GEOG 440	Advanced-Applications in GIS
LA/NR 218	Applications in GIS
or GEOG 318	Applications in GIS
MCRO 224	General Microbiology I ⁶
MCRO 424	Microbial Physiology
MCRO 436	Microbial Ecology
MSCI 328	Marine Ecology
MSCI 437	Marine Botany
MSCI 439	Fisheries Science and Resource Management
MSCI 440	Communicating Ocean Sciences to Informal Audiences
NR 418	Applied GIS
SS 121	Introductory Soil Science
SS 321	Soil Morphology
SS 322	Soil Plant Relationships
SS 422	Soil Ecology
STAT 313	Applied Experimental Design and Regression Models
STAT 419	Applied Multivariate Statistics

Total units 43

¹ Excess units will be applied to subsequent concentration electives.

² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

³ Courses taken to meet a major or support requirement cannot be double-counted as an elective.

⁴ If BIO 461 or BIO 462 is used to meet the Senior Project Requirement, it cannot also be counted as an Elective.

⁵ Maximum of 6 units may be applied toward Approved Electives from "by arrangement" courses: BIO 400, BIO 461, BIO 462, BIO 463, BIO 472, ENGR 322/SCM 302.

⁶ Recommended for students interested in health science careers.

Molecular and Cellular Biology Concentration

BIO 452	Cell Biology	4
BIO/CHEM 475	Molecular Biology Laboratory	3
CHEM 217	Organic Chemistry II	3
CHEM 220	Organic Chemistry Laboratory For Life Sciences II	1
CHEM 371	Biochemical Principles	5
CHEM 372	Metabolism	4
MCRO 224	General Microbiology I	5
Advanced Cell and Molecular Applications ¹		
Select from the following:		9
ASCI 403	Applied Biotechnology in Animal Science	
BIO 405	Developmental Biology	
BIO 426	Immunology	
BIO 428	Hematology	
BIO/CHEM 441	Bioinformatics Applications	
BIO/CHEM 476	Gene Expression Laboratory	
CHEM 474	Protein Techniques Laboratory	
MCRO 402	General Virology	
MCRO 433	Microbial Biotechnology	
Approved Electives ^{1,2,3,4}		
Select from any 300-400 level BIO/BOT/MCRO/MSCI courses or select from the following:		9
ASCI 403	Applied Biotechnology in Animal Science	
ASCI 406	Applied Animal Embryology and Assisted Reproduction	
ASCI 503	Advanced Molecular Techniques in Animal Science	
BIO/CHEM 202	Orientation to Biotechnology	
CHEM 218	Organic Chemistry III	
CHEM 223	Organic Chemistry Laboratory for Life Sciences III	
CHEM 331	Quantitative Analysis	
CHEM 377	Chemistry of Drugs and Poisons	
CHEM 418	Neurochemistry	
CHEM 474	Protein Techniques Laboratory	
CHEM 528	Nutritional Biochemistry	
ENGR 322/SCM 302	The Learn By Doing Lab Teaching Practicum	
ES/WGS 350	Gender, Race, Culture, Science and Technology	
PHIL 339 or PHIL 341 or SCM 451	Biomedical Ethics Professional Ethics Ethics in the Sciences	
STAT 313	Applied Experimental Design and Regression Models	
Total units		43

- ¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
- ² Consult with your faculty advisor for approval to use other relevant upper-division coursework in other departments.
- ³ Courses taken to meet a major or support requirement cannot be double-counted as an elective.
- ⁴ Maximum of 6 units may be applied toward Approved Electives from "by arrangement" courses: BIO 330, BIO 400, BIO 450, BIO 461, BIO 462, BIO 463, BIO 471, BIO 472, BIO 485, BIO 495, ENGR 322/SCM 302.

Wildlife and Biodiversity Conservation Concentration

BIO 401	Principles of Conservation Biology	4
BOT 313	Taxonomy of Vascular Plants	4
BOT 433	Field Botany: California Plant Diversity	5
LA/NR 218 or GEOG 318	Applications in GIS Applications in GIS	3
Zoology Courses		
Select from the following: ¹		12
BIO 321	Mammalogy	
BIO 322	Ichthyology	
BIO 323	Ornithology	
BIO 324	Herpetology	
BIO 335	General Entomology	
BIO 336	Invertebrate Zoology	
Ecology Courses		
Select from the following:		8
BIO 427	Wildlife Management	
BIO 444	Population Ecology	
BIO 445	Community Ecology	
Approved Electives ^{2,3}		
Select from the following:		7
ASCI 329	Principles of Range Management	
BIO 321	Mammalogy	
BIO 322	Ichthyology	
BIO 323	Ornithology	
BIO 324	Herpetology	
BIO 327	Wildlife Ecology	
BIO 329	Vertebrate Field Zoology	
BIO 330	Extended Field Biology Activity	
BIO 335	General Entomology	
BIO 336	Invertebrate Zoology	
BIO 400	Special Problems for Advanced Undergraduates ⁵	
BIO 415	Biogeography	
BIO 419	Analytical Methods in Ecology	
BIO 427	Wildlife Management	
BIO 429	Parasitology	
BIO 434	Environmental Physiology	
BIO 442	Behavioral Ecology	

BIO 444	Population Ecology	
BIO 445	Community Ecology	
BIO 446	Ecosystem Ecology	
BIO 461	Senior Project - Research Proposal ^{4, 5}	
BIO 462	Senior Project - Research ^{4, 5}	
BIO 463	Honors Research ⁵	
BOT 326	Plant Ecology	
ENGR 322/ SCM 302	The Learn By Doing Lab Teaching Practicum ⁵	
GEOG 440	Advanced-Applications in GIS	
MSCI 328	Marine Ecology	
MSCI 437	Marine Botany	
MSCI 439	Fisheries Science and Resource Management	
NR 141	Introduction to Forest Ecosystem Management	
NR 142	Environmental Management	
NR 404	Environmental Law	
NR 416	Environmental Impact Analysis and Management	
NR 418	Applied GIS	
NR 425	Applied Resource Analysis and Assessment	
STAT 313	Applied Experimental Design and Regression Models	
STAT 324 or STAT 334	Applied Regression Analysis Applied Linear Models	
STAT 330	Statistical Computing with SAS	
STAT 416	Statistical Analysis of Time Series	
STAT 419	Applied Multivariate Statistics	
STAT 421	Survey Sampling and Methodology	
Total units		43

- ¹ Students seeking certification as an Associate Wildlife Biologist via the Wildlife Society should see their faculty advisor for assistance.
- ² Consultation with a faculty advisor is recommended prior to selecting approved electives; selections may impact pursuit of post-baccalaureate studies and/or goals.
- ³ Courses taken to meet a major or support requirement cannot be double-counted as an elective.
- ⁴ If BIO 461 or BIO 462 is used to meet the Senior Project Requirement, it cannot also be counted as an Approved Elective.
- ⁵ Maximum of 6 units may be applied toward Approved Electives from "by arrangement" courses: BIO 400, BIO 461, BIO 462, BIO 463, ENGR 322/SCM 302.

BS Marine Sciences

Program Learning Objectives

Graduates of the BS Marine Sciences program will be able to:

1. Integrate and synthesize information from the various marine disciplines.
2. Recognize and value the diversity of marine life and ecosystems.

3. Apply the scientific method, by formulating hypotheses, making predictions, and assessing, analyzing, synthesizing, and interpreting data.
4. Communicate marine scientific principles and research findings effectively to diverse audiences verbally and in writing.
5. Demonstrate proficiency in lab and field techniques relevant to marine sciences.
6. Locate and utilize bibliographic resources and demonstrate the ability to evaluate scientific literature.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

BIO 160	Diversity and History of Life	4
BIO 161	Introduction to Cell and Molecular Biology (B2,B4) ¹	4
BIO 162	Introduction to Organismal Form and Function	4
BIO 263	Introductory Ecology and Evolution	4
BIO 461 or BIO 462	Senior Project - Research Proposal ² Senior Project - Research	2
CHEM 302	Marine Chemistry	3
MSCI 100	Introduction to Marine Sciences	1
MSCI 301	Biological Oceanography	3
MSCI 303	Ocean Sampling Techniques	3
MSCI 328	Marine Ecology	4
PSC 201	Physical Oceanography	4

Marine Resources Conservation and Policy

Select from the following:		4
BIO 401	Principles of Conservation Biology	
MSCI 428	Marine Conservation and Policy	
MSCI 438	Aquaculture	
MSCI 439	Fisheries Science and Resource Management	

Marine Biodiversity

Select from the following:		4
BIO 322	Ichthyology	
BIO 336	Invertebrate Zoology	
MCRO 436	Microbial Ecology	
MSCI 324	Marine Mammals, Birds and Reptiles	
MSCI 437	Marine Botany	

Communicating Science

Select from the following:		1-4
COMS 390	Environmental Communication	

COMS 395	Science Communication
ENGR 322/ SCM 302	The Learn By Doing Lab Teaching Practicum ³
MSCI 401	Marine Science Outreach
MSCI 440	Communicating Ocean Sciences to Informal Audiences

Electives

Select additional courses from Marine Resource Conservation and Policy, Marine Biodiversity, or Communicating Science (above) or select from the following:³

23-26

AG/EDES/ENGR/ GEOG/ISLA/ SCM/UNIV 350	The Global Environment (Area F) ⁴
BIO 200	Special Problems for Undergraduates
BIO 327	Wildlife Ecology
BIO 330	Extended Field Biology Activity ³
BIO 351	Principles of Genetics
BIO 361	Principles of Animal Physiology
BIO 400	Special Problems for Advanced Undergraduates ³
BIO 414	Evolution
BIO 415	Biogeography
BIO 419	Analytical Methods in Ecology
BIO 434	Environmental Physiology
BIO 442	Behavioral Ecology
BIO 444	Population Ecology
BIO 445	Community Ecology
BIO 446	Ecosystem Ecology
BIO 450	Undergraduate Laboratory Assistantship ³
BIO 452	Cell Biology
BIO 461	Senior Project - Research Proposal ^{2,3}
BIO 462	Senior Project - Research ^{2,3}
BIO 463	Honors Research ³
BIO 470	Selected Advanced Topics ³
BIO 471	Selected Advanced Laboratory ³
BIO 472	Current Topics in Biological Research ³
BIO/CHEM 475	Molecular Biology Laboratory
CHEM 217	Organic Chemistry II
CHEM 218	Organic Chemistry III
CHEM 220	Organic Chemistry Laboratory For Life Sciences II
or CHEM 221	Organic Chemistry Laboratory II
CHEM 223	Organic Chemistry Laboratory for Life Sciences III
or CHEM 324	Organic Chemistry Laboratory III
CHEM 313	Survey of Biochemistry and Biotechnology
CHEM 331	Quantitative Analysis
CHEM 341	Environmental Chemistry: Water Pollution

CHEM 371	Biochemical Principles
CHEM 372	Metabolism
CHEM 400	Special Problems for Advanced Undergraduates
CPE/CSC 101	Fundamentals of Computer Science
CSC/CPE 202	Data Structures
CSC/CPE 203	Project-Based Object-Oriented Programming and Design
CRP/NR 404	Environmental Law
EE 201	Electric Circuit Theory
EE 321	Electronics
ENGR 400	Special Problems for Advanced Undergraduates
ENVE 434	Water Chemistry and Water Quality Measurements
MATH 143	Calculus III
MATH 244	Linear Analysis I
MCRO 436	Microbial Ecology
MSCI 307	World Aquaculture: Applications, Methodologies and Trends
MSCI 330	Technologies for Ocean Discovery (Area F) ⁴
MSCI 410	Scientific Diving
NR/LA 317	The World of Spatial Data and Geographic Information Technology (Area F) ⁴
NR 321	Water Systems Technology, Issues and Impacts (Area F) ⁴
PHYS 400	Special Problems for Advanced Undergraduates
STAT 323	Design and Analysis of Experiments I
STAT 324 or STAT 334	Applied Regression Analysis Applied Linear Models
STAT 330	Statistical Computing with SAS
STAT 331	Statistical Computing with R
SUPPORT	
CHEM 127	General Chemistry for Agriculture and Life Science I (B3) ¹ 4
CHEM 128	General Chemistry for Agriculture and Life Science II 4
CHEM 129	General Chemistry for Agriculture and Life Science III 4
CHEM 216 or CHEM 312	Organic Chemistry I Survey of Organic Chemistry 5
GEOL 102	Introduction to Geology 4
MATH 141 or MATH 161	Calculus I (B1) ^{1,5} Calculus for the Life Sciences I 4
MATH 142 or MATH 162	Calculus II (B1) ^{1,5} Calculus for the Life Sciences II 4
PHYS 121 or PHYS 141	College Physics I ⁶ General Physics IA 4
PHYS 122 or PHYS 132	College Physics II ⁶ General Physics II 4
PHYS 123	College Physics III ⁶ 4

or PHYS 133	General Physics III	
STAT 218	Applied Statistics for the Life Sciences	4
STAT 313	Applied Experimental Design and Regression Models	4
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		56
FREE ELECTIVES		
Free Electives ⁴		4
Total units		180

¹ Required in Major/Support; also satisfies GE.

² If BIO 461 or BIO 462 meets the Senior Project requirement, it cannot also be counted for Approved Electives.

³ Maximum of 6 units may be applied toward Approved Electives from "by arrangement" courses: BIO 330, BIO 400, BIO 450, BIO 461, BIO 462, BIO 463, BIO 470, BIO 471, BIO 472, ENGR 322/ SCM 302.

⁴ If a course double counts for GE Area F as well as Approved Electives, four additional units of Free Electives will be needed to meet 180 total units required for degree.

⁵ Students emphasizing Chemistry, Physics or Engineering should take MATH 141 and MATH 142 instead of MATH 161 and MATH 162. GE B1 will be met with any of the following: MATH 161, MATH 162, MATH 141, MATH 142.

⁶ Students emphasizing Physics should take PHYS 141, PHYS 132 and PHYS 133 instead of PHYS 121, PHYS 122 and PHYS 123. GE B3 will be met with any of the following: PHYS 141, PHYS 132, PHYS 121 or PHYS 122.

General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Major or Support) ¹	0
B2	Life Science (4 units in Major or Support) ¹	0
B3	Physical Science (4 units in Major or Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	

D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		56

BS Microbiology

Program Learning Objectives

1. Students will demonstrate a writing style appropriate for communicating scientific results to a diverse audience.
2. Students will integrate math, physical sciences and technology to answer biological questions using the scientific method.
3. Students will demonstrate proficiency of lab and field techniques in their area of specialization.
4. Students will master and retain fundamental concepts in biology (atom to ecosystem).
5. Students will demonstrate the skill to assess and analyze data with objectivity.
6. Students will demonstrate proficiency in searching, reading and evaluating the scientific literature.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support, or concentration courses may be selected as credit/no credit.

MAJOR COURSES

BIO 160	Diversity and History of Life	4
BIO 161	Introduction to Cell and Molecular Biology (B2&B4)	4
BIO 263	Introductory Ecology and Evolution	4
BIO 351	Principles of Genetics	5
BIO 426	Immunology	4
BIO 452	Cell Biology	4
MCRO 224	General Microbiology I	5
MCRO 225	General Microbiology II	5
MCRO 402	General Virology	4
MCRO 423	Medical Microbiology	5
MCRO 424	Microbial Physiology	5
BIO 461	Senior Project - Research Proposal	2
or BIO 462	Senior Project - Research	
Electives		

Select from the following: ^{1,2,3,5}

19

Biotechnology

MCRO 433	Microbial Biotechnology
ASCI 403	Applied Biotechnology in Animal Science
BIO 202	Orientation to Biotechnology
BIO/CHEM 441	Bioinformatics Applications
BIO/CHEM 475	Molecular Biology Laboratory
BIO/CHEM 476	Gene Expression Laboratory
BRAE 448	Bioconversion
CHEM 331	Quantitative Analysis
CHEM 372	Metabolism
CHEM 373	Molecular Biology
CHEM 474	Protein Techniques Laboratory

Food Microbiology

MCRO/WVIT 301	Wine Microbiology
MCRO 421	Food Microbiology
DSCI 402	Quality Assurance and Control of Dairy Products
DSCI 434	Cheese and Fermented Dairy Foods
DSCI 444	Dairy Microbiology
FSN 230	Elements of Food Processing
FSN 275	Elements of Food Safety
FSN 335	Food Quality Assurance
FSN 341	Fermented Foods
FSN 364	Food Chemistry
FSN 368	Food Analysis
FSN 374	Food Laws and Regulations
FSN 474	Advanced Food Processing

Medical and Public Health Microbiology

MCRO 320	Emerging Infectious Diseases
MCRO 342	Public Health Microbiology
ASCI 203	Animal Parasitology
ASCI 312	Production Medicine
ASCI 321	Zoonoses and Veterinary Public Health Concerns
ASCI 438	Systemic Animal Physiology
ASCI 440	Immunology and Diseases of Animals
BIO 162	Introduction to Organismal Form and Function
BIO 406	Advanced Anatomy and Physiology: Neuroscience
BIO 407	Advanced Anatomy and Physiology: Endocrinology
BIO 408	Advanced Anatomy and Physiology: Cardiorespiratory and Renal
BIO 409	Advanced Anatomy and Physiology: Muscle and Locomotion
BIO 410	Functional Histology
BIO 428	Hematology
BIO 429	Parasitology
CHEM 331	Quantitative Analysis
CHEM 349	Chemical and Biological Warfare

CHEM 377	Chemistry of Drugs and Poisons
CHEM 477	Biochemical Pharmacology
KINE 301	Functional Anatomy

Microbial Ecology and Evolution

MCRO 436	Microbial Ecology
BIO 414	Evolution
CHEM 341	Environmental Chemistry: Water Pollution
ENVE 434	Water Chemistry and Water Quality Measurements
SS 422	Soil Ecology

Other electives for Microbiology Majors

AEPS 313	Agricultural Entomology
AEPS/BOT 323	Plant Pathology
AEPS 441	Biological Control for Pest Management
BIO 335	General Entomology
BIO 336	Invertebrate Zoology
BIO 361	Principles of Animal Physiology
BIO 400	Special Problems for Advanced Undergraduates
BIO 434	Environmental Physiology
BIO 450	Undergraduate Laboratory Assistantship ¹
BIO 462	Senior Project - Research ⁶
BIO 463	Honors Research
CHEM 218 & CHEM 223	Organic Chemistry III and Organic Chemistry Laboratory for Life Sciences III
CHEM 418	Neurochemistry
CHEM 419	Bioorganic Chemistry
MATH 162	Calculus for the Life Sciences II
MCRO 100	Introduction to Microbiology Research
SCM 451	Ethics in the Sciences
STAT 313	Applied Experimental Design and Regression Models
STAT 419	Applied Multivariate Statistics
STAT 421	Survey Sampling and Methodology

SUPPORT COURSES

CHEM 127	General Chemistry for Agriculture and Life Science I (B3&B4)	4
CHEM 128	General Chemistry for Agriculture and Life Science II	4
CHEM 129	General Chemistry for Agriculture and Life Science III	4
CHEM 216	Organic Chemistry I ³	5
CHEM 217 & CHEM 220	Organic Chemistry II and Organic Chemistry Laboratory For Life Sciences II ³	4
CHEM 313 or CHEM 371	Survey of Biochemistry and Biotechnology ⁴ Biochemical Principles	5
MATH 161	Calculus for the Life Sciences I (B1) ³	4

PHYS 121	College Physics I	4
PHYS 122	College Physics II	4
PHYS 123	College Physics III	4
STAT 218	Applied Statistics for the Life Sciences (B1)	4
GENERAL EDUCATION (GE)		
(See list of GE program requirements below.)		56
FREE ELECTIVES		
Free Electives ⁵		8
Total units		180

¹ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

² Limited to a total of 4 units from BIO 400, BIO 450, BIO 462, and BIO 463. At least 14 units must be upper division (300-400 level).

³ Students planning to attend graduate or professional schools are strongly advised to meet with their advisors to ensure that they meet necessary prerequisites for entry into these programs. Additional courses in math and chemistry may be necessary.

⁴ CHEM 371 suggested for students who plan to pursue graduate school or a health professions career.

⁵ Care must be taken to ensure compliance with the "60 units of upper-division" requirement.

⁶ If BIO 462 is used to meet the Senior Project Requirement, it cannot also be counted as an Approved Elective.

General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Major) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4

D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		56

¹ Required in Major/Support; also satisfies GE.

Biology Minor

Note: No courses in the minor may be taken as credit/no credit.

Introductory courses ¹

Select three courses from the following: 12-14

BIO 111	General Biology
or BIO 161	Introduction to Cell and Molecular Biology
BIO 112	Environmental Biology and Conservation
BIO 114	Plant Diversity and Ecology
or BOT 121	General Botany
BIO 123	Biology of Sex
BIO 160	Diversity and History of Life
BIO 162	Introduction to Organismal Form and Function
or BIO 211	Biology of Plants and Animals
BIO 227	Wildlife Conservation Biology
BIO 231	Human Anatomy and Physiology I
BIO 232	Human Anatomy and Physiology II
BIO 263	Introductory Ecology and Evolution
MCRO 221	Microbiology
or MCRO 224	General Microbiology I

Upper-division electives (300-400 level) ^{1, 2}

Select at least 4 courses from the following: 16

BIO, BOT, MCRO, MSCI or ZOO, with the exception of BIO 450, BIO 485, BIO 495 and MSCI 401.

A maximum of 1 unit of BIO 400 may be used in the minor.

Total units 28-30

¹ Check prerequisites. Upper-division courses designed for Biological Sciences majors usually require some combination of BIO 160, BIO 161, BIO 162 and BIO 263 as prerequisites.

² Suggested combinations of courses in particular areas of biology are available in the department. Specific combinations of courses may not be allowed if the courses overlap too much in content. Students must obtain prior approval from one of the Biology Minor advisors.

Microbiology Minor

Required Courses

MCRO 221	Microbiology	4-5
or MCRO 224	General Microbiology I	
MCRO 225	General Microbiology II	5
Select from the following:		4-5
MCRO 402	General Virology	

MCRO 423	Medical Microbiology	
MCRO 424	Microbial Physiology	
Approved Electives		
Select from the following:		11-13
BIO 426	Immunology	
BIO 428	Hematology	
BIO 429	Parasitology	
DSCI 444	Dairy Microbiology	
MCRO 301	Wine Microbiology	
MCRO 320	Emerging Infectious Diseases	
MCRO 342	Public Health Microbiology	
MCRO 402	General Virology	
MCRO 421	Food Microbiology	
MCRO 423	Medical Microbiology	
MCRO 424	Microbial Physiology	
MCRO 433	Microbial Biotechnology	
MCRO 436	Microbial Ecology	
SS 422	Soil Ecology	
Total units		26

MA Biological Sciences

NOTE: Applications for Fall 2018 admission to the MA Biological Sciences program are not currently being accepted. Contact the Biological Sciences department for further information.

Required Courses

BIO 501	Molecular & Cellular Biology	4
BIO 502	Biology of Organisms	4
BIO 503	Population Biology	4
BIO 590	Seminar in Biology (1, 1, 1)	3
BIO 500	Individual Study	4

Electives

Advisor approved electives 500-level	11
Advisor approved electives 400- or 500- level	15

Satisfactory completion of the comprehensive examinations.

Total units¹ 45

¹ All 45 units must be acceptable for graduate credit and in accordance with Graduate Guidelines of the Biological Sciences Department. For further information, students should communicate with the Chair of the Biological Sciences Department or with the Director of the Graduate and Research Committee.

MS Biological Sciences

Program Learning Objectives

1. Demonstrate a broad basic knowledge of the biological sciences.
2. Demonstrate a thorough understanding and competency in a specific discipline within the biological sciences.
3. Communicate scientific ideas effectively in both oral and written formats.
4. Think critically and evaluate, design, conduct, and quantitatively assess innovative research in a biological discipline.

5. Apply acquired skills and knowledge needed for employment or advanced graduate or professional study in discipline related areas.

Required Courses

BIO 501	Molecular & Cellular Biology	4
BIO 502	Biology of Organisms	4
BIO 503	Population Biology	4
BIO 561	Proposal Writing for Biological Research	3
BIO 590	Seminar in Biology (1, 1, 1)	3
BIO 591	Trends in Biology (1, 1)	2
BIO 599	Thesis	9

Select from the following:¹ 4

BIO 419	Analytical Methods in Ecology	
STAT 419	Applied Multivariate Statistics	
STAT 513	Applied Experimental Design and Regression Models	
STAT 523	Design and Analysis of Experiments I	
STAT 524	Applied Regression Analysis	

Electives

Additional units at the 400 or 500 level.^{1,2} 12

Total units 45

¹ If a STAT course is chosen, Electives must include 3 units taken within the Biological Sciences Department at Cal Poly in order to meet the program requirement of 32 units.

² Students planning to be Teaching Assistants at Cal Poly must take BIO 574.

All 45 units must be acceptable for graduate credit and in accordance with Graduate Guidelines of the Biological Sciences Department. Coursework must include 32 units taken within the Biological Sciences Department at Cal Poly. For further information, students should communicate with the Chair of the Biological Sciences Department or with the Director of the Graduate and Research Committee.

MS Biological Sciences, Specialization in Regenerative Medicine

Required Courses

ASCI 581	Graduate Seminar in Animal Science	1
ASCI/BIO/BMED 593	Regenerative Medicine Internship (5,5) ¹	10
ASCI/BIO/BMED 594	Applications in Regenerative Medicine	2
BIO 475	Molecular Biology Laboratory	3
BIO 501	Molecular & Cellular Biology	4
BIO 502	Biology of Organisms	4
BIO 534	Principles of Stem Cell Biology	2
BIO 590	Seminar in Biology	1
BMED 510	Principles of Tissue Engineering	4
BMED 515	Introduction to Biomedical Imaging	4
BMED 560	Cell Transplantation and Biotherapeutics	2

BMED 561	Cell Transplantation and Biotherapeutics Laboratory	2
BMED 563	Biomedical Engineering Graduate Seminar	2
Electives		
Approved engineering, science, mathematics and statistics electives		4
Total units		45

¹ Students will complete their internship at one of our partner institutions. An updated list of our current partners can be found on our program website.

Chemistry & Biochemistry

Baker Center for Sciences and Mathematics Bldg. (180), Room 206

Phone: 805.756.2693

<https://chemistry.calpoly.edu>

Department Chair: Seth Bush

Academic Programs

Program name	Program type
Biochemistry	BS
Chemistry	BS
Polymers and Coatings Science	MS

The Chemistry and Biochemistry Department has two roles in the university: to provide professional education for students who are majors in chemistry and biochemistry and who plan careers in the natural sciences and related fields, and to provide instruction in the fundamentals of chemistry to students with majors in fields related to chemistry, especially in the life sciences, agriculture, and engineering.

The department offers a flexible chemical education degree option for students interested in a career in pre-college science education. Interested students should contact the single subject teaching credential advisor early in their academic career for more information.

Career opportunities for chemists are increasing. There are openings in traditional areas such as environmental analysis, the health professions, industrial research and production, pharmacology, toxicology, product quality control, and teaching at the secondary or university level. Newer opportunities lie in related areas such as library science, market research, patent law, and safety engineering

Undergraduate Programs

BS Biochemistry

The Chemistry and Biochemistry Department provides curricula leading to the Bachelor of Science in Biochemistry and the Bachelor of Science in Biochemistry with a concentration in Polymers and Coatings.

The baccalaureate curriculum in biochemistry includes required courses in general chemistry, analytical chemistry, inorganic chemistry, organic chemistry, biochemistry and physical chemistry. Advanced undergraduates choose electives from courses that cover a broad range of specialized topics, such as environmental chemistry, nutritional biochemistry, advanced organic and physical chemistry, pharmacology, and polymer chemistry. The curriculum emphasizes laboratory work, especially current techniques and the use of instrumentation in all fields of chemistry. The program provides opportunities for independent research under faculty guidance, including a requirement for a senior project. A senior project may consist of pure or applied research in biochemistry, or it may involve interdisciplinary work with another field such as art, biology, agriculture, civil or environmental engineering, psychology, or soil science. Under the department's cooperative education program, bachelor's degree candidates may work full-time in industry or government for one or two quarters, for pay and academic credit.

There are a number of career opportunities in the fields of biotechnology and polymers and coatings. Students completing a degree in biochemistry or a concentration in polymers and coatings are prepared

for direct entry into these careers, as well as for postgraduate education in a professional specialty.

Concentration

Polymers and Coatings Concentration

Students may select the Polymers and Coatings concentration instead of advanced approved biochemistry electives in Major Courses.

The concentration includes the required courses in the biochemistry curriculum and electives in the area of polymers, coatings, surface chemistry and materials engineering. The concentration gives students the background and practical experience to move into a rewarding career in a wide range of fields including paints and coatings, resins, plastics, adhesives and sealants.

BS Chemistry

The Chemistry and Biochemistry Department provides curricula leading to the Bachelor of Science in Chemistry and the Bachelor of Science in Chemistry with a certified concentration in Polymers and Coatings. Both the BS in Chemistry and the concentration in Polymers and Coatings are certified by the American Chemical Society. An option in Chemical Education designed for aspiring teachers in secondary schools is also available.

The baccalaureate curriculum in chemistry includes required courses in general chemistry, analytical chemistry, inorganic chemistry, organic chemistry, biochemistry and physical chemistry. Advanced undergraduates choose electives from courses that cover a broad range of specialized topics, such as environmental chemistry, nutritional biochemistry, advanced organic and physical chemistry, pharmacology, and polymer chemistry. The curriculum emphasizes laboratory work, especially current techniques and the use of instrumentation in all fields of chemistry. The program provides opportunities for independent research under faculty guidance, including a requirement for a senior project. A senior project may consist of pure or applied research in chemistry, or it may involve interdisciplinary work with another field such as art, biology, agriculture, civil or environmental engineering, psychology, or soil science. Under the department's cooperative education program, bachelor's degree candidates may work full-time in industry or government for one or two quarters, for pay and academic credit.

Career opportunities for chemists lie in traditional areas such as environmental analysis, the health professions, industrial research and production, pharmacology, toxicology, product quality control, and teaching at the secondary or university level. Newer opportunities lie in related areas such as library science, market research, patent law, and safety engineering.

Concentration

Polymers and Coatings Concentration

Students may select the Polymers and Coatings concentration instead of advanced approved biochemistry electives in Major Courses.

The concentration includes the required courses in the biochemistry curriculum and electives in the area of polymers, coatings, surface chemistry and materials engineering. The concentration gives students the background and practical experience to move into a rewarding career in a wide range of fields including paints and coatings, resins, plastics, adhesives and sealants.

Biotechnology Minor

For information regarding the Biotechnology minor, see the College of Science and Mathematics (p. 336) section of the catalog.

Graduate Program Master of Science Degree in Polymers and Coatings Science General Characteristics

The MS degree in Polymers and Coatings Science offers a unique, focused program closely tied to industry. Students gain academic preparation in polymers and coatings science through lecture and laboratory courses, then undertake a rigorous industrial internship or thesis research. Through the internship or thesis research students specialize and develop advanced skills related to their internship work or research. The program is designed to prepare students for challenging careers in the polymers and coatings industry. The program also provides excellent background for doctoral studies in areas related to polymer and coatings science. This program is unique in California and relies on the close relationship between the department and the polymers and coatings industry for its success.

Prerequisites

Students entering the program must have a bachelor's degree from an accredited institution with a minimum grade point average of 2.5 in the last 90 quarter units attempted. Applicants with majors in chemistry, biochemistry, materials engineering, chemical engineering or related fields generally meet the prerequisites for courses in the program. Applicants with degrees in other areas may need to take supplemental courses in organic and physical chemistry and can be admitted conditionally. For information concerning additional departmental requirements, the student should contact the Graduate Advisor in the Chemistry and Biochemistry Department.

Advancement to candidacy requires completion of 12 units of an approved study plan with a minimum grade point average of 3.0.

Blended BS + MS Program in Chemistry or Biochemistry (BS) and Polymers and Coatings Science (MS)

The blended program provides motivated students with an accelerated route to the MS in Polymers and Coatings Science, with simultaneous conferring of both bachelor's and master's degrees. Students in the blended program are provided with a seamless process whereby they can progress from undergraduate to graduate status.

Eligibility

Students majoring in chemistry or biochemistry may be eligible to pursue the blended program toward the MS in Polymers and Coatings Science. Participation in the program is based on prior academic performance and other measures of professional promise, with a minimum GPA of 2.5 required (3.0 recommended). Students are generally selected for the blended program by a faculty committee during the junior year. Please see the catalog description on Blended Programs for eligibility criteria.

Students may begin taking the required graduate courses in either their junior or senior year depending on their preparation. Students may not pursue both the Concentration in Polymers and Coatings and the MS in Polymers and Coatings Science. Students pursuing the concentration

take the 400-level polymers and coatings courses while those pursuing the MS degree take the 500-level polymers and coatings courses. Students cannot receive credit for both 400 and 500-level courses in the same topic.

Students in the blended program are eligible to begin the Industrial Internship or Thesis Research upon completion of the required graduate-level chemistry courses.

BS Biochemistry Program Learning Objectives

1. Understand and apply the fundamental concepts of chemistry in the following areas: calculation and estimation, structure, and properties of atoms, ions and molecules, chemical bonding and chemical reactivity.
2. Use techniques and modern tools to conduct, design, analyze, and interpret experiments in chemistry and biochemistry.
3. Communicate effectively with the scientific community.
4. Apply concepts of math, physical and biological sciences to chemical problems.
5. Integrate the concepts, skills and attitudes from a general education with his/her major program to understand and explain the impact of chemistry, science and technology on issues in global, economic, environmental, and societal contexts.

Degree Requirements and Curriculum

In addition to the program requirements on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

CHEM 124	General Chemistry for Physical Science and Engineering I (B3 & B4) ¹	4
CHEM 125	General Chemistry for Physical Science and Engineering II	4
CHEM 126	General Chemistry for Physical Science and Engineering III	4
CHEM 203	Undergraduate Seminar I	1
CHEM 216	Organic Chemistry I	5
CHEM 217	Organic Chemistry II	3
CHEM 218	Organic Chemistry III	3
CHEM 221	Organic Chemistry Laboratory II	2
CHEM 303	Undergraduate Seminar II	1
CHEM 324	Organic Chemistry Laboratory III	2
CHEM 331	Quantitative Analysis ²	5
CHEM 351	Physical Chemistry I	3
CHEM 352	Physical Chemistry II	3
CHEM 353	Physical Chemistry III	3

CHEM 354	Physical Chemistry Laboratory	2
CHEM 371	Biochemical Principles	5
CHEM 372	Metabolism	4
CHEM 373	Molecular Biology	3
CHEM 403	Undergraduate Seminar III: Senior Project	1
CHEM/BIO 475	Molecular Biology Laboratory	3
Select from the following:		3
BIO 476	Gene Expression Laboratory	
CHEM 474	Protein Techniques Laboratory	
Select from the following:		12/18

Polymers and Coatings Concentration (18 units)**Approved Advanced Biochemistry Electives (12 units)³**

One course must be a lecture, and at least two courses must be from List A.

List A:

BIO/CHEM 308	Genetic Engineering Technology (Area F) ⁴	
or CHEM 349	Chemical and Biological Warfare	
or ENVE 324	Introduction to Air Pollution	
or SCM 335	Nuclear Science and Society	
or SCM 360	Selected Environmental Issues of California's Central Coast	
CHEM 252	Laboratory Glassblowing	
CHEM 302	Marine Chemistry	
CHEM 341	Environmental Chemistry: Water Pollution	
CHEM 357	Physical Chemistry III Lab	
CHEM 377	Chemistry of Drugs and Poisons	
CHEM 400	Special Problems for Advanced Undergraduates ⁵	
CHEM 401	Advanced Undergraduate Research ⁶	
CHEM 405	Advanced Physical Chemistry	
CHEM 414	Advanced Organic Chemistry - Mechanisms	
CHEM 419	Bioorganic Chemistry	
CHEM 420	Advanced Organic Chemistry - Synthesis	
CHEM 439	Instrumental Analysis	
CHEM 441	Bioinformatics Applications	
CHEM 444	Polymers & Coatings I	
CHEM 445	Polymers & Coatings II	
CHEM/MATE 446	Surface Chemistry of Materials	
CHEM 447	Polymers and Coatings Laboratory I	
CHEM 448	Polymers and Coatings Laboratory II	
CHEM 449	Polymers and Coatings Internship	
CHEM 450	Polymers and Coatings III	
CHEM 451	Polymers and Coatings Laboratory III	
CHEM 454	Functional Polymeric Materials	
CHEM 458	Instrumental Organic Qualitative Analysis	
CHEM 463	Honors Research	
CHEM 465	College Teaching Practicum	
CHEM 466	Learning Assistant Seminar	

CHEM 470	Selected Advanced Topics	
CHEM 474	Protein Techniques Laboratory	
CHEM 477	Biochemical Pharmacology	
CHEM 481	Inorganic Chemistry	
CHEM 484	Inorganic Chemistry Laboratory	
CHEM 485	Cooperative Education Experience ⁵	
CHEM 495	Cooperative Education Experience ⁵	
CHEM 528	Nutritional Biochemistry	
SCM 302/ ENGR 322	The Learn By Doing Lab Teaching Practicum	
SCM 451	Ethics in the Sciences	

List B

BIO 351	Principles of Genetics	
BIO 361	Principles of Animal Physiology	
BIO 405	Developmental Biology	
BIO 406	Advanced Anatomy and Physiology: Neuroscience	
BIO 407	Advanced Anatomy and Physiology: Endocrinology	
BIO 408	Advanced Anatomy and Physiology: Cardiorespiratory and Renal	
BIO 409	Advanced Anatomy and Physiology: Muscle and Locomotion	
BIO 410	Functional Histology	
BIO 426	Immunology	
BIO 452	Cell Biology	
MCRO 402	General Virology	
MCRO 423	Medical Microbiology	
MCRO 424	Microbial Physiology	

SUPPORT COURSES

BIO 161	Introduction to Cell and Molecular Biology (B2 & B4) ¹	4
BIO 452	Cell Biology	4-5
or MCRO 224	General Microbiology I	
MATH 141	Calculus I (B1) ¹	4
MATH 142	Calculus II (B1) ¹	4
MATH 143	Calculus III	4
PHYS 141	General Physics IA	4
PHYS 132	General Physics II	4
PHYS 133	General Physics III	4

GENERAL EDUCATION (GE)

(See GE program requirements below.) 56

FREE ELECTIVES

Free Electives	9-16
Total units	180

¹ Required in Major/Support; also satisfies GE.

² Students should take CHEM 331 as soon as possible after completing CHEM 126.

³ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

⁴ These courses also satisfy Area F requirements.

⁵ No more than 2 units may apply toward Approved Advanced Biochemistry Electives.

⁶ No more than 4 units may apply to Approved Advanced Biochemistry Electives.

Concentration

Students may select the following concentration instead of advanced approved biochemistry electives in Major Courses

- Polymers and Coatings (p. 359)

General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Major) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		56

¹ Required in Major/Support.

Polymers and Coatings Concentration - BS Biochemistry

CHEM 444	Polymers & Coatings I	3
CHEM 445	Polymers & Coatings II	3
CHEM 446	Surface Chemistry of Materials	3
CHEM 447	Polymers and Coatings Laboratory I	2
CHEM 448	Polymers and Coatings Laboratory II	2

CHEM 450	Polymers and Coatings III	3
Select from the following:		2
CHEM 449	Polymers and Coatings Internship	
CHEM 451	Polymers and Coatings Laboratory III	
Total units		18

BS Chemistry

Program Learning Objectives

- Understand and apply the fundamental concepts of chemistry in the following areas: calculation and estimation, structure and properties of atoms, ions and molecules, chemical bonding and chemical reactivity.
- Use techniques and modern tools to conduct, design, analyze, and interpret experiments in chemistry and biochemistry.
- Communicate effectively with the scientific community.
- Apply concepts of math, physical and biological sciences to chemical problems.
- Integrate the concepts, skills and attitudes from a general education with his/her major program to understand and explain the impact of chemistry, science and technology on issues in global, economic, environmental, and societal contexts.

Degree Requirements and Curriculum

In addition to the program requirements on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

CHEM 124	General Chemistry for Physical Science and Engineering I (B3 & B4) ¹	4
CHEM 125	General Chemistry for Physical Science and Engineering II	4
CHEM 126	General Chemistry for Physical Science and Engineering III	4
CHEM 203	Undergraduate Seminar I	1
CHEM 216	Organic Chemistry I	5
CHEM 217	Organic Chemistry II	3
CHEM 218	Organic Chemistry III	3
CHEM 221	Organic Chemistry Laboratory II	2
CHEM 303	Undergraduate Seminar II	1
CHEM 324	Organic Chemistry Laboratory III	2
CHEM 331	Quantitative Analysis ²	5
CHEM 351	Physical Chemistry I	3
CHEM 352	Physical Chemistry II	3
CHEM 353	Physical Chemistry III	3
CHEM 354	Physical Chemistry Laboratory	2

CHEM 357	Physical Chemistry III Lab	1
CHEM 371	Biochemical Principles	5
CHEM 403	Undergraduate Seminar III: Senior Project	1
CHEM 439	Instrumental Analysis	5
CHEM 481	Inorganic Chemistry	3
CHEM 484	Inorganic Chemistry Laboratory	2
Select from the following: ³		15/18
Polymers and Coatings Concentration (18 units)		
Approved Advanced Chemistry Electives (15 units)		
BIO/CHEM 308	Genetic Engineering Technology (Area F) ⁴	
or CHEM 349	Chemical and Biological Warfare	
or ENVE 324	Introduction to Air Pollution	
or SCM 335	Nuclear Science and Society	
or SCM 360	Selected Environmental Issues of California's Central Coast	
BIO/CHEM 441	Bioinformatics Applications	
BIO/CHEM 475	Molecular Biology Laboratory	
CHEM 252	Laboratory Glassblowing	
CHEM 302	Marine Chemistry	
CHEM 341	Environmental Chemistry: Water Pollution	
CHEM 372	Metabolism	
CHEM 373	Molecular Biology	
CHEM 377	Chemistry of Drugs and Poisons	
CHEM 400	Special Problems for Advanced Undergraduates ⁵	
CHEM 401	Advanced Undergraduate Research ⁶	
CHEM 405	Advanced Physical Chemistry	
CHEM 414	Advanced Organic Chemistry - Mechanisms	
CHEM 419	Bioorganic Chemistry	
CHEM 420	Advanced Organic Chemistry - Synthesis	
CHEM 444	Polymers & Coatings I	
CHEM 445	Polymers & Coatings II	
CHEM/MATE 446	Surface Chemistry of Materials	
CHEM 447	Polymers and Coatings Laboratory I	
CHEM 448	Polymers and Coatings Laboratory II	
CHEM 449	Polymers and Coatings Internship	
CHEM 450	Polymers and Coatings III	
CHEM 451	Polymers and Coatings Laboratory III	
CHEM 454	Functional Polymeric Materials	
CHEM 458	Instrumental Organic Qualitative Analysis	
CHEM 463	Honors Research	
CHEM 465	College Teaching Practicum	
CHEM 466	Learning Assistant Seminar	
CHEM 470	Selected Advanced Topics	
CHEM 474	Protein Techniques Laboratory	
CHEM 477	Biochemical Pharmacology	
CHEM 485	Cooperative Education Experience ⁵	

CHEM 495	Cooperative Education Experience ⁵	
CHEM 528	Nutritional Biochemistry	
SCM 302/ENGR 322	The Learn By Doing Lab Teaching Practicum	
SCM 451	Ethics in the Sciences	
SUPPORT COURSES		
BIO 161	Introduction to Cell and Molecular Biology (B2 & B4) ¹	4
MATH 141	Calculus I (B1) ¹	4
MATH 142	Calculus II (B1) ¹	4
MATH 143	Calculus III	4
MATH 241	Calculus IV	4
Select from the following:		3-4
CSC 232	Computer Programming for Scientists and Engineers	
CSC 234	C and Unix	
CSC 235	Fundamentals of Computer Science for Scientists and Engineers I	
MATH 206	Linear Algebra I	
MATH 244	Linear Analysis I	
STAT 218	Applied Statistics for the Life Sciences	
STAT 312	Statistical Methods for Engineers	
PHYS 141	General Physics IA	4
PHYS 132	General Physics II	4
PHYS 133	General Physics III	4
Physics elective (200-level and above)		3
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		56
FREE ELECTIVES		
Free Electives		5-9
Total units		180

¹ Required in Major/Support; also satisfies GE.

² Students should take CHEM 331 as soon as possible after completing CHEM 126.

³ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

⁴ These courses also satisfy Area F requirements.

⁵ No more than 2 units may apply to approved advanced chemistry electives.

⁶ No more than 4 units may apply to approved advanced chemistry electives.

Concentration

Students may select the following concentration instead of advanced approved chemistry electives in Major Courses.

- [Polymers and Coatings](#) (p. 361)

General Education (GE) Requirements

- 72 units required, 16 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).

- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Major) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		56

¹ Required in Major/Support; also satisfies GE.

Polymers and Coatings Concentration - BS Chemistry

CHEM 444	Polymers & Coatings I	3
CHEM 445	Polymers & Coatings II	3
CHEM 446	Surface Chemistry of Materials	3
CHEM 447	Polymers and Coatings Laboratory I	2
CHEM 448	Polymers and Coatings Laboratory II	2
CHEM 450	Polymers and Coatings III	3
Select from the following:		2
CHEM 449	Polymers and Coatings Internship	
CHEM 451	Polymers and Coatings Laboratory III	
Total units		18

MS Polymers and Coatings Science Program Learning Objectives

1. Integrate knowledge of the diverse range of chemistry sub-disciplines as well as non-chemistry disciplines such as fluid flow, mechanics, and science of appearance, and apply it in their profession.

2. Use traditional and nontraditional thinking to define a problem, identify potential alternatives, gather appropriate knowledge and information to formulate and articulate a solution.

3. Think critically and be able to evaluate, design, and conduct research in the polymers and coatings field.

4. Effectively communicate as professionals in both individual and team-based environments.

5. Join polymer and coating related industries or advanced graduate programs and be immediately productive. Demonstrate dedication, loyalty and passion toward the chosen professional career.

Required Courses

CHEM 544	Polymer Physical Chemistry and Analysis	3
CHEM 545	Polymer Synthesis and Mechanisms	3
CHEM 547	Polymer Characterization and Analysis Laboratory	2
CHEM 548	Polymer Synthesis Laboratory	2
CHEM 550	Coatings Formulation Principles	3
CHEM 551	Coatings Formulation Laboratory	2
CHEM 590	Graduate Seminar in Polymers and Coatings (1, 1, 1)	3

Select from the following: 9

CHEM 598	Graduate Project (3, 3, 3)	
CHEM 599	Graduate Thesis (3, 3, 3)	

Approved Electives

18 units of advisor-approved electives (at least 3 units must be from 500 level). See department for list.

Total units 45

A complete project report or thesis must be submitted to the graduate committee. Guidelines on how to prepare report or thesis are available from the graduate coordinator.

Kinesiology and Public Health

Kinesiology Bldg. (43A), Room 451
 Phone: 805.756.2545
 Email: kinesiology@calpoly.edu
<https://kinesiology.calpoly.edu>
<https://stride.calpoly.edu>

Department Chair: Kris Jankovitz

Academic Programs

Program name	Program type
Kinesiology	BS, MS
Public Health	BS

The Kinesiology and Public Health Department offers undergraduate and graduate degree programs in Kinesiology and an undergraduate degree in Public Health. The department also contributes to the general education and elective needs of all students by providing GE Area D4 courses in health education, upper-division courses in GE Area D5, first aid/CRP/AED courses, physical activity courses and elective courses in the kinesiology and public health sub disciplines. The curricula and coursework in the Kinesiology and Public Health Department is designed to meet the mission of preparing students to be leaders in the fields of exercise science, physical activity, public health, and disease prevention and treatment.

The Kinesiology and Recreation Center complex provides laboratory, research and office space for the Kinesiology and Public Health Department, and provides access to quality physical activity and sport facilities for students, faculty and staff.

The Kinesiology and Public Health Department is also home to the STRIDE Center (Solutions through Research in Diet & Exercise). STRIDE is a university-wide, multidisciplinary, obesity research center, initiated in 2007 by the Kinesiology and Public Health Department. The STRIDE center provides students with unique opportunities to engage in research, community outreach and programs to promote health and wellbeing.

Undergraduate Programs

BS Kinesiology

The BS in Kinesiology provides training in the multiple sub-disciplines of kinesiology (biomechanics, exercise physiology, health, motor behavior, and sport and exercise psychology/ sociology). The program offers a broad based curriculum incorporating the scientific and clinical knowledge of exercise science, sport science and health promotion that is applicable to preventive and clinical exercise, commercial fitness, sport instruction and educational settings. Students can elect to follow one of three concentrations: Exercise Science, Sport Science or Health Promotion. Each concentration provides students with the knowledge, skills and abilities they need to pursue further education or move into a variety of entry level positions in exercise and sport sciences and health promotion.

Concentrations

Exercise Science

Exercise science professionals lead and demonstrate safe and effective methods of exercise to clients in a variety of settings. Students who complete the Exercise Science Concentration will be prepared to work in a wide range of enterprises that include clinical exercise physiology,

cardiac rehabilitation, worksite health promotion and commercial fitness facilities. Completion of this concentration could lead to certification as a Certified Health and Fitness Specialist (ACSM), Clinical Exercise Specialist (ACSM), Certified Strength and Conditioning Specialist (NSCA) and Exercise Physiologist-Certified (ASEP).

Health Promotion

Students who complete the Health Promotion Concentration will be prepared for employment in a variety of health promotion related careers. Possible job titles include: Health Promotion Program Coordinator, Health and Wellness Manager, Prevention Coordinator, Physical Activity and Public Health Specialist, Worksite Health Promotion Specialist, Military Wellness Center Manager, Personal Trainer, Health & Fitness Specialist, University Wellness Coordinator, Fitness Manager, and Lifestyle Coach.

Sport Science

Students who complete the BS in Kinesiology with the sport science concentration will be prepared for entry level leadership positions in competitive sport settings which include coaching at the youth, club/ interscholastic, college/university and international levels. They would also be prepared for advanced study in master's degree programs with an emphasis in coaching, or for employment as a personal trainer or group exercise instructor. Course content and learning experiences are focused on fundamentals of athletic and sport performance, psychological and sociological benefits of participating in sport and athletics and skill development in leadership and mentoring. Students who complete this concentration will also be well prepared to take the American College of Sports Medicine (ACSM) Certified Personal Trainer Exam and the ACSM Certified Group Instructor Exam. They will also be prepared to complete a wide variety of American Sport Education Program (ASEP) certification courses, request inclusion in the National Registry of Coaches (coordinated by ASEP) and pursue coaching certification from sport specific governing bodies (e.g. USA Track and Field, USA Swimming, USA Soccer, etc.).

BS Public Health

New program, effective Fall 2018

The BS in Public Health will provide students with the knowledge, skills, and experiences necessary to meet current public health challenges to promote health and prevent disease. The program offers a broad foundation in multiple areas of public health, to include ample opportunities for hands-on application of knowledge in classes, field experience, and research projects, as well as requiring community-oriented outreach activities to promote health. The curriculum aligns with the critical component elements approved by Association of Schools of Public Health for undergraduate programs in Public Health. The program prepares students to meet the professional practices standards as developed by the National Commission for Health Education Credentialing (NCHEC.org) to qualify for the certification exam for Certified Health Education Specialists (CHES). Students select one of the four concentrations: Community and Public Health, Culture and Society in Health, Physical Activity in Public Health and Worksite and University Health Promotion. Each concentration provides students the opportunity to partner with faculty, campus and community organizations to discover how to apply public health principles to promote health and prevent disease.

Concentrations

Community and Public Health

Students who complete the Community and Public Health Concentration will be prepared for careers in local, state and federal public health departments; non-profit health agencies and coalitions; health insurance providers, hospital, clinical and research settings; and to pursue graduate study for the Masters in Public Health and the MS in Health Care Administration, Community Health, Environmental Health, Health Education or Health Promotion. This concentration provides a foundation in concepts that are complementary for students who are planning to pursue graduate study in the allied health professions or medicine.

Culture and Society in Health

Students who complete the Culture and Society in Health Concentration will be prepared with a strong foundation in the social determinants of health. Graduates are prepared for careers in a variety of settings such as local, state and federal public health agencies, non-profit health agencies, hospital, clinical and research settings, and to pursue graduate study for the Masters in Public Health. This concentration provides a foundation in concepts that are complementary for students who are planning to pursue graduate study in the allied health professions or medicine.

Physical Activity in Public Health

Students who complete the Physical Activity in Public Health Concentration will be prepared to work with organizations engaged in planning to promote physical activity and improve health outcomes. Graduates are prepared for careers in local, state and federal public health agencies, non-profit health agencies and coalitions, local government agencies, corporate and commercial fitness settings. Students who pursue this concentration will also qualify for the ACSM/NPAS Physical Activity in Public Health Specialist (PAPHS) certification (ACSM.org). In addition, it prepares students to pursue graduate study for the Masters in Public Health, the MS in Kinesiology, Health Promotion, or Health Education.

Worksite and University Health Promotion

Students who complete the Worksite and University Health Promotion Concentration are prepared for careers as health promotion/wellness specialists in various public/private worksites, college/university settings, non-profit health agencies, health insurance providers, and to pursue graduate study for the Masters in Public Health, the MS in Community Health, Health Promotion, Health Education, or Occupational Health.

Graduate Program

Master of Science Degree in Kinesiology

NOTE: Applications for Fall 2018 admission to the MS Kinesiology program are not currently being accepted. Contact the Kinesiology and Public Health department for further information.

General Characteristics

The degree program offers advanced study in kinesiology to prepare graduates to enter occupations that may require training beyond the bachelor's degree. The program is designed to strengthen the breadth and depth of the student's academic preparation in kinesiology and its sub-disciplines and improve competence for: a) positions in corporate/commercial, community, non-profit or government exercise and health promotion programs, b) teaching physical education, health or exercise science at the community college level, c) positions in obesity, diabetes and heart disease prevention in community, clinical or rehabilitative

health care settings, d) independent research in the field of emphasis, and e) continued graduate study at doctoral granting institutions.

Two program options are available:

Thesis Option: 39 units of graduate committee approved coursework, 6 units of thesis research/project design, and successful completion of an oral defense of the thesis/project.

Non-Thesis Option: 45 units of graduate committee approved coursework and a comprehensive examination.

Most kinesiology graduate courses are offered every other year on a rotational basis. Students admitted with classified graduate standing can typically complete the program within two academic years. Applications to the program are currently accepted every quarter; however, a fall quarter entry is best for optimal progression toward completion of the degree.

Prerequisites

Applicants to the program must have a bachelor's degree from an accredited institution with a minimum grade point average of 3.0 in the last 90-quarter units. Letters of recommendation from persons knowledgeable about the applicant's academic achievement and potential as a graduate student are required.

Classified Graduate Standing

For admission to the program with classified graduate standing, the applicant must have an undergraduate degree in kinesiology or the equivalent academic preparation as determined by the coordinator of the kinesiology graduate program. Applicants with a grade point average below the required 3.0 and an undergraduate degree in kinesiology may appeal to the graduate coordinator to be "conditionally" accepted. This procedure involves a review process and a specified contract to be successfully completed before admission to classified graduate standing. Special attention is focused upon student performance in undergraduate science and kinesiology coursework for applicants with a GPA below 3.0 requesting to be conditionally accepted.

Conditionally Classified Graduate Standing

Applicants to the program without an undergraduate degree in kinesiology or closely related academic preparation may be admitted to the program with conditionally classified graduate standing. Applicants with undergraduate deficiencies must remove these deficiencies through coursework or examination before Advancement to Candidacy and may complete this coursework while enrolled as a graduate student at Cal Poly.

Information regarding specific coursework prerequisites and application procedures for admission to the kinesiology master of science program is available on the department website at <https://kinesiology.calpoly.edu> or from the graduate program coordinator.

Advancement to Candidacy

For Advancement to Candidacy a student shall have:

- successfully completed all conditionally classified requirements
- successfully completed the Graduation Writing Requirement
- filed a formal study plan
- maintained a minimum 3.0 GPA for all course work completed on the formal study plan

Requirements for the Degree

The formal study plan must include 45 units of graduate committee approved coursework. The approved coursework on the formal study plan is designed to prepare the student to achieve his/her stated career objective. At least 30 of the units must be completed at the 500 level in Kinesiology.

All candidates must meet the current Graduation Writing Requirement.

Each candidate must successfully complete a comprehensive examination before the degree is granted. The examination can take one of two forms: (1) those students following the thesis option must successfully defend the thesis or project in an oral examination, or (2) those students following the non-thesis option must pass a comprehensive examination dealing with current general knowledge in the discipline of kinesiology and the application of coursework taken on the formal study plan.

If the degree requirements are not completed within 7 years, the student will need to complete additional requirements as determined by the graduate committee. See the catalog for "Time Limit for Degree" for more information.

Up to 15 units may be taken in 400/500-level courses outside of the Kinesiology Department with graduate committee approval provided these courses were not required as part of the undergraduate degree program. Only 12 units of 400-level kinesiology courses may be put on the formal study plan.

At least 32 units must be completed in residence and no more than 9 units of graduate committee approved extension courses may be included on the formal study plan.

BS Kinesiology

Program Learning Objectives

1. Demonstrate proficiency in critical thinking through written and oral communication.
2. Apply knowledge of the social and behavioral sciences to the study and practice of exercise, physical activity and sport.
3. Apply knowledge of the natural sciences (e.g. physical, biological, and environmental sciences) to the study and practice of exercise, physical activity and sport.
4. Apply the principles of quantitative and qualitative research to the study and practice of exercise, physical activity and sport.
5. Demonstrate an understanding of diversity, social justice, and inclusion as it relates to exercise, health, physical activity and sport.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: Up to 4 units of credit/no credit grading may be selected for courses in major, support, or concentration.

MAJOR COURSES

KINE 180	Orientation to Kinesiology	2
KINE 181	First Aid/CPR/AED	1
KINE 250 or KINE 255 or KINE 260	Healthy Living Personal Health: A Multicultural Approach Women's Health Issues	4
KINE 266	Sport and Exercise Psychology	4
KINE 301	Functional Anatomy	3
KINE 303	Physiology of Exercise	4
KINE 304	Pathophysiology and Exercise	3
KINE 319	Introduction to Research Methods in Kinesiology	4
KINE 401	Managing Exercise and Health Programs	3
KINE 402	Motor Learning and Control	4
KINE 403	Biomechanics	4
KINE 407	Adapted Physical Activity	4
KINE 451	Nutrition for Fitness and Sport	3
KINE 452	Exercise Testing and Prescription for Fitness Specialists	4
KINE 454	Exercise Metabolism	3
KINE 459	Personal and Group Fitness Instruction	3
KINE 460 or KINE 461 or KINE 462 or KINE 463	Experiential Senior Project Senior Project Report Research Honors Senior Project Exercise Science and Health Promotion Fieldwork	1
Approved Electives		
Select from the following:		8
BIO 162	Introduction to Organismal Form and Function	
BIO 253	Health Professions Shadowing	
BIO 305	Biology of Cancer	
CHEM 129	General Chemistry for Agriculture and Life Science III	
CHEM 217 & CHEM 220	Organic Chemistry II and Organic Chemistry Laboratory For Life Sciences II	
CHEM 313	Survey of Biochemistry and Biotechnology	
COMS 212	Interpersonal Communication	
COMS 213	Organizational Communication	
COMS 301	Business and Professional Communication	
COMS 316	Intercultural Communication	
FSN 310	Maternal and Child Nutrition	
FSN 315	Nutrition in Aging	
FSN 415	Nutrition Education and Communications	
FSN 416	Community Nutrition	
IME 320	Human Factors and Technology	
KINE 297	Medical Terminology	
KINE 305	Drugs in Society ³	
KINE 308	Motor Development ³	

KINE 320	Media and Technology in Health Promotion ³	
KINE 323	Sport and Gender	
KINE 406	Neuroanatomy	
KINE 446	Echocardiography	
PHYS 122	College Physics II	
PHYS 123	College Physics III	
PSY 201 or PSY 202	General Psychology	
PSY 252	Social Psychology	
PSY 256	Developmental Psychology	
PSY 302	Behavior in Organizations	
PSY 310	Psychology of Death	
PSY 318	Psychology of Aging	
PSY 320	Health Psychology	
PSY 340	Biopsychology	
PSY 350	Teamwork	
RPTA 160	Introduction to Sport Management	
RPTA 257	Leadership and Diverse Groups	
RPTA 275	Facilitation and Teambuilding	
RPTA 450	Resource and Grant Development	
Select one concentration ²		18-19
SUPPORT COURSES		
BIO 161	Introduction to Cell and Molecular Biology	4
BIO 231	Human Anatomy and Physiology I	5
BIO 232	Human Anatomy and Physiology II	5
CHEM 127	General Chemistry for Agriculture and Life Science I	4
CHEM 128	General Chemistry for Agriculture and Life Science II	4
CHEM 312 or CHEM 216	Survey of Organic Chemistry Organic Chemistry I	5
MATH 119 or MATH 141	Precalculus Trigonometry Calculus I	4
PHYS 121	College Physics I	4
STAT 218	Applied Statistics for the Life Sciences	4
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		52
FREE ELECTIVES		
Free Electives		8-9
Total units		180

¹ Required in Major/Support; also satisfies GE.

² Students may have to complete additional coursework to satisfy admission requirements for graduate or professional degree programs in the allied health professions. Students interested in these programs should consult their academic advisor or visit the College of Science and Mathematics Advising Office for more information.

³ Cannot double-count in approved electives if required in concentration.

Concentrations

Students may select one of the following concentrations.

- Exercise Science (p. 365)
- Health Promotion (p. 366)
- Sport Science (p. 366)

General Education (GE) Requirements

- 72 units required, 20 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Support) ¹	0
B2	Life Science (4 units in Support) ¹	0
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy ²	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E) (4 units in Major) ¹	0
D5	Upper-division elective (no KINE course)	4
Area F	Technology	
F	Upper-division elective	4
Total units		52

¹ Required in Major/Support; also satisfies GE.

² Students pursuing the Sport Science concentration must take PHIL 230 or PHIL 231 to fulfill GE Area C2 in order to have the prerequisite for concentration courses.

Exercise Science Concentration

KINE 408	Exercise and Health Gerontology	3
KINE 445	Electrocardiography	4
KINE 449	Exercise Prescription and Leadership	3
KINE 453	Obesity Prevention and Treatment	4

Select from the following:		4
KINE 450	Worksite and University Health Promotion Programs	
PHIL 339	Biomedical Ethics	
PSY 311	Environmental Psychology	
PSY 330	Behavioral Effects of Psychoactive Drugs	
Total units		18

¹ Students seeking admission to graduate or professional degree programs in the allied health professions may need additional coursework to meet admission requirements. Please consult an advisor for assistance.

Health Promotion Concentration

KINE 265	Introduction to Community and Public Health	3
KINE 305	Drugs in Society	4
KINE 320	Media and Technology in Health Promotion	4
KINE 450	Worksite and University Health Promotion Programs	4
KINE 453	Obesity Prevention and Treatment	4
Total units		19

Sport Science Concentration

KINE 278	Introduction to Perspectives in Physical Activity	4
KINE 308	Motor Development	3
KINE 324	Sports, Media and American Popular Culture	4
KINE 366	Applied Sport Psychology	3
RPTA 260	Community Relations and Sports-Based Youth Development	4
Total units		18

BS Public Health

Program Learning Objectives

1. Identify and apply the scientific evidence base of human health and disease, and of public health to design programs and services that improve health outcomes.
2. Apply the basic concepts, methods and tools of public health data collection and analysis to monitor health status and understand factors that influence health outcomes at the local, state, national and global levels.
3. Provide information using a variety of communication strategies to facilitate the adoption of healthy behavior.
4. Develop, evaluate and improve programs and services to improve health outcomes at all levels of the social ecological model.
5. Apply interdisciplinary and community based approaches to improve health outcomes.
6. Develop and advocate for public health policies and plans to promote and protect the health of individuals, families, and communities.

7. Examine the legal, ethical and economic dimensions of health care and public health policies, the roles and responsibilities of local, state and federal agencies and their influence on health outcomes.
8. Examine the history and philosophy, core functions and the value of public health across the globe and in society.
9. Appraise the socio-economic, behavioral, biological, environmental, and other factors that impact human health and contribute to health disparities.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: Up to 4 units of credit/no credit grading may be selected for courses in major, support, or concentration.

MAJOR COURSES

HLTH 101	Orientation to Public Health	1
HLTH/KINE 255	Personal Health: A Multicultural Approach	4
or HLTH 260	Women's Health Issues	
HLTH/KINE 265	Introduction to Community and Public Health	3
HLTH/KINE 298	Disease Epidemiology	4
HLTH 299	Behavioral Epidemiology	4
HLTH/KINE 305	Drugs in Society	4
HLTH 310	Injury Prevention	3
HLTH/KINE 320	Media and Technology in Health Promotion	4
HLTH 334	Health Behavior Theory	3
HLTH 402	Research Methods in Public Health Settings	4
HLTH 405	Stress, Health and Chronic Illness	4
HLTH 410	Global Health	4
HLTH/KINE 434	Health Promotion Program Planning	4
HLTH/KINE 435	Health Promotion Program Implementation and Evaluation	4
HLTH/KINE 453	Obesity Prevention and Treatment	4
HLTH 460	Experiential Senior Project	1
or HLTH 461	Senior Project Report	
or HLTH 462	Research Senior Project	
or HLTH 463	Public Health Internship	

Approved Electives²

Approved electives have been organized by area of interest to guide students in their selections. Any course listed below can be used as an elective; courses not listed below can serve as an elective but require faculty advisor approval.

Select from the following:	12
At least 4 units must be at the 300-400 level	

Culture and Health

ANT 201	Cultural Anthropology
ANT 250	Biological Anthropology
ANT 360	Human Cultural Adaptations
ANT 425	Meaning, Gender, and Identity in Anthropological Theory (Area F, USCP)
HNRS 304/ ISLA 303	Values and Technology (C4)
HNRS/ISLA 320	Topics and Issues in Values, Media and Culture
WGS 301	Contemporary Issues in Women's and Gender Studies

Life and Physical Science

BIO 123	Biology of Sex
BIO 162	Introduction to Organismal Form and Function
BIO 302 or BIO 303	Human Genetics Survey of Genetics
BIO 305	Biology of Cancer
CHEM 128	General Chemistry for Agriculture and Life Science II
CHEM 129	General Chemistry for Agriculture and Life Science III
CHEM 216	Organic Chemistry I
CHEM 217	Organic Chemistry II
CHEM 218	Organic Chemistry III
CHEM 312	Survey of Organic Chemistry
CHEM 313	Survey of Biochemistry and Biotechnology
MCRO 225	General Microbiology II
MCRO 320	Emerging Infectious Diseases
MCRO 342	Public Health Microbiology
MCRO 421	Food Microbiology
PHYS 121	College Physics I
PHYS 122	College Physics II

Health Communication

COMS 212	Interpersonal Communication
COMS 213	Organizational Communication
COMS 301	Business and Professional Communication
COMS 316	Intercultural Communication
COMS 418	Health Communication
JOUR 219	Multicultural Society and the Mass Media
JOUR 312	Public Relations
JOUR 412	Public Relations and Crisis Management

Built Environment and Health

CRP 212	Introduction to Urban Planning
CRP 214	Land Use and Transportation Studies
CRP 215	Planning for and with Multiple Publics

CRP 325 Reflections on Biking, Walking and the City

CRP 426 Planning Healthy Communities

NR 218 Applications in GIS

Health and Nutrition

FSN 310 Maternal and Child Nutrition

FSN 315 Nutrition in Aging

HLTH/KINE 297 Medical Terminology

HLTH/KINE 450 Worksite and University Health Promotion Programs

Exercise and Fitness

KINE 303 Physiology of Exercise

KINE 304 Pathophysiology and Exercise

KINE 408 Exercise and Health Gerontology

KINE 452 Exercise Testing and Prescription for Fitness Specialists

Public Policy and Health

POLS 310 The Politics of Race, Class, Gender and Sexuality (USCP)

POLS 333 World Food Systems (Area F)

POLS 351 Public Policy and Administration

POLS 451 Technology and Public Policy

POLS 459 The Politics of Poverty

RPTA 450 Resource and Grant Development

Behavioral Health

PSY 252 Social Psychology

PSY 256 Developmental Psychology

PSY 302 Behavior in Organizations

PSY 310 Psychology of Death

PSY 311 Environmental Psychology

PSY 318 Psychology of Aging

PSY 320 Health Psychology

PSY 330 Behavioral Effects of Psychoactive Drugs

PSY 340 Biopsychology

PSY 344 Behavioral Genetics

PSY 405 Abnormal Psychology

PSY 372 Multicultural Psychology

SOC 326 Sociology of the Life Cycle

Spanish

SPAN 101 Elementary Spanish I
or SPAN 111 Elementary Hispanic Language and Culture

SPAN 102 Elementary Spanish II

SPAN 103 Elementary Spanish III

SPAN 104 Intensive Elementary Spanish

SPAN 201 Intermediate Spanish I

SPAN 202 Intermediate Spanish II

SPAN 203 Intermediate Spanish III

Statistics

STAT 323 Design and Analysis of Experiments I

STAT 324 Applied Regression Analysis

STAT 330 Statistical Computing with SAS

STAT 331 Statistical Computing with R

Select one concentration	19-20
SUPPORT COURSES	
ANT 201 or SOC 110	Cultural Anthropology (D3) ¹ Comparative Societies 4
BIO 161	Introduction to Cell and Molecular Biology (B2 & B4) ¹ 4
BIO 231	Human Anatomy and Physiology I 5
BIO 232	Human Anatomy and Physiology II 5
CHEM 127	General Chemistry for Agriculture and Life Science I (B3 & B4) ¹ 4
FSN 210	Nutrition 4
MCRO 221 or MCRO 224	Microbiology General Microbiology I 4-5
PSY 201 or PSY 202	General Psychology (D4) ¹ General Psychology 4
STAT 218	Applied Statistics for the Life Sciences (B1) ¹ 4
STAT 313	Applied Experimental Design and Regression Models (B1) ¹ 4
GENERAL EDUCATION (GE)	
See GE program requirements below.)	48
FREE ELECTIVES	
Free Electives	3-4
Total units	180

¹ Required in Support; also satisfies GE.

² Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.

Concentrations

Students may select one of the following concentrations.

Community and Public Health (p. 368)

Culture and Society in Health (p. 368)

Physical Activity in Public Health (p. 369)

Worksite and University Health Promotion (p. 369)

General Education (GE) Requirements

- 72 units required, 24 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A Communication

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation and Writing	4

Area B Science and Mathematics

B1 Mathematics/Statistics (8 units in Support) ¹	0
B2 Life Science (4 units in Support) ¹	0
B3 Physical Science (4 units in Support) ¹	0
B4 One lab taken with either a B2 or B3 course	

Area C Arts and Humanities

C1 Literature	4
C2 Philosophy	4

C3 Fine/Performing Arts	4
C4 Upper-division elective (may be in Concentration) ²	0-4
Area C elective (Choose one course from C1-C5)	4
Area D/E Society and the Individual	
D1 The American Experience (Title 5, Section 40404 requirement)	4
D2 Political Economy	4
D3 Comparative Social Institutions (4 units in Support) ¹	0
D4 Self Development (CSU Area E) (4 units in Support) ¹	0
D5 Upper-division elective	4
Area F Technology	
F Upper-division elective	4
Total units	48

¹ Required in Support; also satisfies GE.

² Required in Culture and Society in Health Concentration; also satisfies GE.

Community and Public Health Concentration

FSN 310 or FSN 315	Maternal and Child Nutrition Nutrition in Aging 4
JOUR 312 or POLS 351	Public Relations Public Policy and Administration 4
MCRO 320	Emerging Infectious Diseases 3
MCRO 342	Public Health Microbiology 4
Select from the following: 4	
CRP 212	Introduction to Urban Planning
CRP 215	Planning for and with Multiple Publics
CRP 325	Reflections on Biking, Walking and the City
CRP 426	Planning Healthy Communities
Total units	19

Culture and Society in Health Concentration

COMS 316 or COMS 418	Intercultural Communication Health Communication 4
PSY 252 or PSY 310 or PSY 372	Social Psychology Psychology of Death Multicultural Psychology 4
PHIL 339	Biomedical Ethics (C4) 4
Select from the following: 8	
ANT 250	Biological Anthropology
ANT 401	Culture and Health
ANT 402	Nutritional Anthropology
ES/WGS 350	Gender, Race, Culture, Science and Technology
POLS 310	The Politics of Race, Class, Gender and Sexuality

POLS/WGS 457	U.S. Reproductive Politics
POLS 459	The Politics of Poverty
PSY 344	Behavioral Genetics
PSY 360	Applied Social Psychology

Total units 20

Physical Activity in Public Health Concentration

KINE 278	Introduction to Perspectives in Physical Activity	4
KINE 303	Physiology of Exercise	4
KINE 452	Exercise Testing and Prescription for Fitness Specialists	4
NR 218	Applications in GIS	3
Select from the following:		4
CRP 212	Introduction to Urban Planning	
CRP 215	Planning for and with Multiple Publics	
CRP 325	Reflections on Biking, Walking and the City	

Total units 19

Worksite and University Health Promotion Concentration

COMS 301	Business and Professional Communication	4
or JOUR 312	Public Relations	
HLTH/KINE 450	Worksite and University Health Promotion Programs	4
KINE 401	Managing Exercise and Health Programs	3
PSY 330	Behavioral Effects of Psychoactive Drugs	4
or PSY 340	Biopsychology	
PSY 302	Behavior in Organizations	4
or PSY 350	Teamwork	
or PSY 352	Conflict Resolution: Violent and Nonviolent	

Total units 19

MS Kinesiology

NOTE: Applications for Fall 2018 admission to the MS Kinesiology program are not currently being accepted. Contact the Kinesiology department for further information.

Program Learning Objectives

1. Demonstrate analytical thinking in Kinesiology and the sub-disciplines.
2. Exhibit the best practices, values, and ethics of the profession.
3. Demonstrate breadth and depth of knowledge in Kinesiology and the sub-disciplines.
4. Effectively communicate knowledge in Kinesiology and the sub-disciplines.

5. Be qualified applicants for doctoral programs and/or careers in Kinesiology and the sub-disciplines.

Thesis Option

Required Courses

KINE 501	Evaluation of Literature and Current Trends in Kinesiology	3
KINE 511	Administration in Exercise and Health Settings	4
KINE 517	Research Methods in Kinesiology	4
Select from the following:		12
KINE 503	Current Health Issues	
KINE 522	Advanced Biomechanics	
KINE 525	Advanced Motor Learning and Control	
KINE 526	Advanced Sport and Exercise Psychology	
KINE 530	Advanced Physiology of Exercise	
KINE 539	Effective Practice in Teaching and Coaching	

Approved 400-500 electives 10

Select from the following: 12

KINE 518	Research Prospectus and Proposal Writing	
KINE 599	Thesis or Project (3, 3)	
STAT 513	Applied Experimental Design and Regression Models	
Elective appropriate for thesis research or applied project (4)		

Total units 45

Curriculum for MS Kinesiology - Non-Thesis Option

Required Courses

KINE 501	Evaluation of Literature and Current Trends in Kinesiology	3
KINE 511	Administration in Exercise and Health Settings	4
KINE 517	Research Methods in Kinesiology	4
Select from the following:		12-20
KINE 503	Current Health Issues	
KINE 522	Advanced Biomechanics	
KINE 525	Advanced Motor Learning and Control	
KINE 526	Advanced Sport and Exercise Psychology	
KINE 530	Advanced Physiology of Exercise	
KINE 539	Effective Practice in Teaching and Coaching	

Approved 400-500 electives 10-20

STAT 511 Statistical Methods 4

Comprehensive Exam is Required

Total units 45

For more detailed information or advisement, contact the Kinesiology graduate program coordinator.

Liberal Studies, an Undergraduate Teacher Preparation Program

Faculty Offices East (Bldg. 25), Room 125B
Phone: 805.756.2935; Fax: 805.756.2967
<https://liberalstudies.calpoly.edu>

Department Chair: Lola Berber-Jimenez

Academic Program

Program name	Program type
Liberal Studies	BS

Liberal Studies is Cal Poly's pre-professional Teacher Preparation Program leading to enrollment in a multiple subject credential program. The mission of Liberal Studies is to ensure that students are prepared to teach competently and professionally each of the seven content areas in the state-mandated curriculum (K-8). These include language arts, mathematics, science, history/social sciences, visual and performing arts, health/physical education and human development. Liberal Studies provides the educational experience and preparation best suited for the prospective elementary teacher.

Faculty from the following disciplines help to offer the required curriculum in the major: Art and Design, Biological Sciences, English, Ethnic Studies, History, Kinesiology, Mathematics, Music, Philosophy, Political Science, Physics, Psychology and Child Development, Social Sciences, Statistics, Theatre, and Education.

Undergraduate Program BS Liberal Studies

A depth of study is required of all students seeking a multiple subject credential by the California Commission on Teaching Credentialing. Liberal Studies majors select one of the following concentrations or, with prior approval from the department chair, an individualized course of study.

- Biology
- Child Development
- English
- History/Social Sciences
- Mathematics
- Science
- Spanish
- Teaching English as a Second Language

BS Liberal Studies

Program Learning Objectives

Upon graduating, Liberal Studies students will:

1. Examine the importance of the physical, social and cognitive development of children and their application to learning.
2. Develop a deep understanding of the conceptual foundation of each core subject area: Reading, Language and Literacy, History and Social Science, Mathematics, Science, Visual and Performing Arts, and Physical Education and Health.

3. Experience how knowledge is created and organized through best teaching and learning practices specific to each core subject area with a focus of metacognition.
4. Demonstrate effective oral, written and interpersonal communication skills in a variety of contexts including the use of appropriate technology.
5. Integrate the content of one discipline into another through the development of projects across subject matter areas.
6. Synthesize information and integrate experiences that promote personal and professional growth in the field of education.
7. Demonstrate engagement as an agent for change in diversity and inclusion using principles of social justice, equity and ethical practice.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: Up to 4 units of credit/no credit grading may be selected for courses in major, support, or concentration.

MAJOR COURSES

LS 201	Orientation to Liberal Studies	1
LS 211	Visual Arts in the Elementary Classroom	4
LS 214	Constitutional Issues in the History of U.S. and California Education	4
LS 230	Field Experience in the Elementary Classroom I	2
LS 250	Field Experience in the Elementary Classroom II	2
LS/ENGL 260	Children's Literature	4
LS 301	Liberal Studies Career Preparation	1
LS 310	Storytelling: Modern Applications of Traditional Narrative	4
LS 370	Performing Arts in the Elementary Classroom	4
LS 410 or LS 411 or LS 412	Subject Matter Seminar Advanced History/Social Sciences Integration for the K-8 Classroom Advanced Arts Integration for the K-8 Classroom	4
LS 461 or LS 462	Senior Project Seminar Senior Project Research	4
ASTR 101	Introduction to the Solar System (B3) ¹	4
BIO 111	General Biology (B2&B4) ¹	4
BIO 211	Biology of Plants and Animals	4
ENGL 391	Topics in Applied Linguistics	4
GEOG 308	Global Geography (D5) ¹	4
HIST 208	Survey of California History (USCP)	4
HIST 210	World History I (D3) ^{1, 2}	4

KINE 310	Concepts and Applications in Elementary Physical Education	3
KINE 443	Health Education for Teachers	4
MATH 227	Mathematics for Elementary Teaching I (B1) ¹	4
MATH 328	Mathematics for Elementary Teaching II	4
MATH 329	Mathematics for Elementary Teaching III	4
MATH 330	Algebraic Thinking with Technology	4
PHIL 230	Philosophical Classics: Knowledge and Reality (C2)	4
or PHIL 231	Philosophical Classics: Ethics and Political Philosophy	
PSC 101	Matter and Energy (B3&B4) ¹	4
PSC 102	Atoms and Molecules	4
PSC 103	The Physical Environment: Earth	4
PSY 201	General Psychology (D4) ¹	4
or PSY 202	General Psychology	
STAT 130	Statistical Reasoning (B1) ¹	4
or STAT 217	Introduction to Statistical Concepts and Methods	
Concentration or individualized course of study		18-22
SUPPORT COURSES		
CD/EDUC 207	Children's Learning and Development in Educational Settings	4
EDUC 427	Theories, Methods, and Assessment of First and Second Language Acquisition in Schools ³	4
EDUC 428	Foundations of K-8 Literacy Teaching and Learning in Schools with Diverse Populations ³	4
GENERAL EDUCATION		
(See GE program requirements below.)		28-36
FREE ELECTIVES		
Free Electives ⁴		1-9
Total units		180

¹ Required in Major; also satisfies GE.

² Students in the History/Social Sciences concentration, may substitute with HIST 221.

³ Prerequisite for Multiple Subject Credential program at Cal Poly. For a credential program elsewhere, check the prerequisites for that institution.

⁴ If GE courses are used to satisfy Concentration requirements, additional units of Free Electives may be required to meet the 180 total units requirement for degree.

Concentrations

Students may select one of the following concentrations or the individualized course of study.

- Biology
- Child Development
- English
- History/Social Sciences

- Mathematics
- Science
- Spanish
- Teaching English as a Second Language

Individualized Course of Study

With department chair approval, students may pursue a course of study which meets their individual needs and interests; this must be initiated early and all courses must be pre-approved. The individualized course of study consists of 18-20 units with at least one course at the 300-400 level. Courses are selected by the student in consultation with an advising faculty member. The list of courses is a contract between the student and the department.

General Education (GE) Requirements

- 72 units required, 32 of which are specified in Major and/or Support.
- See the complete GE course listing.
- Minimum of 12 units required at the 300 level.

Area A Communication

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation and Writing	4

Area B Science and Mathematics

B1 Mathematics/Statistics (8 units in Major) ¹	0
B2 Life Science (4 units in Major) ¹	0
B3 Physical Science (4 units in Major) ¹	0
B4 One lab taken with either a B2 or B3 course	
B5 Area B elective (select one course from B1-B5) (4 units in Major) ¹	0

Area C Arts and Humanities

C1 Literature (may be in Concentration)	0-4
C2 Philosophy	0
C3 Fine/Performing Arts ³	4
C4 Upper-division elective (may be in Concentration)	0-4

Area D/E Society and the Individual

D1 The American Experience (Title 5, Section 40404 requirement) ²	4
D2 Political Economy	4
D3 Comparative Social Institutions (4 units in Major) ¹	0
D4 Self Development (CSU Area E) (4 units in Major) ¹	0
D5 Upper-division elective (4 units in Major) ¹	0

Area F Technology

F Upper-division elective	4
Total units	28-36

¹ Required in Major; also satisfies GE.

² Recommended HIST 201 be taken to satisfy GE Area D1 for individuals planning to pursue a teaching credential.

³ Recommended courses to satisfy GE Area C3: MU 101, DANC 221, or TH 210 for individuals planning to pursue a teaching credential.

Courses Needed for Multiple Subject Credential

EDUC 429	Learning to Teach K-8 Literacy in Schools with Diverse Populations	4
EDUC 431	Learning to Teach K-8 Social Studies with Diverse Populations	4
EDUC 435	Learning to Teach K-8 Mathematics with Diverse Populations	4
EDUC 436	Learning to Teach K-8 Science with Diverse Populations	4
EDUC 438	Multiple Subject Clinical Practice I	4
EDUC 439	Multiple Subject Clinical Practice Seminar I	2
EDUC 440	Educating Individuals with Exceptional Needs	4
EDUC 450	Teaching Performance Assessment Seminar	1
EDUC 454	Multiple Subject Clinical Practice II	8
EDUC 455	Multiple Subject Clinical Practice Seminar II	3
EDUC 456	Multiple Subject Clinical Practice III	12
EDUC 457	Multiple Subject Clinical Practice Seminar III	3
Total units		53

Biology Concentration

BIO 114	Plant Diversity and Ecology	4
or BOT 326	Plant Ecology	
BIO 302	Human Genetics	4
MCRO 221	Microbiology	4
Select from the following:		8
BIO 231	Human Anatomy and Physiology I	
BIO 232	Human Anatomy and Physiology II	
BIO 305	Biology of Cancer	
BIO 308	Genetic Engineering Technology	
BOT 311	Plants, People and Civilization	
BIO 335	General Entomology	
MSCI 307	World Aquaculture: Applications, Methodologies and Trends	
MSCI 330	Technologies for Ocean Discovery	
MSCI 440	Communicating Ocean Sciences to Informal Audiences	

Meet with a faculty advisor if planning to use this concentration for a minor in Biology.

Total units 20

Child Development Concentration

CD 305	Early and Middle Childhood Development	4
CD/PSY 306	Adolescence	4
CD 350	Developmental Issues in Education	4
or CD 351	Learning in Out-of-School Time	

Select from the following:		8
CD/PSY 417	Interpersonal Relationships in Childhood and Adolescence	
CD 424	Children's Learning and Development in Diverse Families and Communities	
PSY 456	Behavioral Disorders in Childhood	
PSY 460	Child Abuse and Neglect	
Total units		20

English Concentration

ENGL 302	Writing: Advanced Composition	4
or ENGL 317	Technical Editing	
ENGL 361	Reading Instruction for the Teaching of Young Adult Literature	5
ENGL 424	Teaching English in Secondary Schools	5
or ENGL 368	Theory and Practice of Peer-to-Peer Writing Instruction	

Select from the following: 4

British Literature

ENGL 330	British Literature in the Age of Belief: to 1485	
ENGL 331	British Literature in the Age of Discovery: 1485-1660	
ENGL 332	British Literature in the Age of Enlightenment: 1660-1798	
ENGL 333	British Literature in the Age of Romanticism: 1798-1832	
ENGL 334	British Literature in the Age of Industrialism: 1832-1914	
ENGL 335	British Literature in the Age of Modernism: 1914-Present	
ENGL 339	Introduction to Shakespeare (C4) ¹	

Select from the following: 4

American Literature

ENGL 340	The Literary Sources of the American Character: 1600-1865	
ENGL 341	The Literary Sources of the American Character: 1865-1914	
ENGL 342	The Literary Sources of the American Character: 1914-1956	
ENGL 343	Multiple Voices of Contemporary American Literature	
ENGL 345	Women Writers of the Twentieth Century (USCP)	
ENGL 346	Ethnic American Literature (USCP)	
ENGL 347	African American Literature (USCP)	

Modern English

ENGL 350	The Modern Novel	
ENGL 351	Modern Poetry	
ENGL 352	Modern Drama	

Total units 22

¹ Required in Concentration; also satisfies GE.

History/Social Sciences Concentration

HIST 322	Modern America	4
Select from the following World History courses:		4
HIST 221	World History, Beginnings to 1000 ¹	
HIST 222	World History, 1000 - 1800	
HIST 223	World History, 1800 - Present	
Select from the following U.S. Government courses:		4
POLS 112	American and California Government	
POLS 315	The American Presidency	
POLS 319	United States Congress	
POLS 348	Early American Political Thought	
POLS 349	Contemporary American Political Thought	
Select from the following World Civilization or World Culture courses:		4
HIST 307	European Thought 1800-2000	
HIST 310	East Asian Culture and Civilization	
HIST 314	Middle East	
HIST 316	Modern East Asia	
HIST 319	Modern South and Southeast Asia	
HIST 334	Modern Europe, 1789-1914	
HIST 335	Modern Europe, 1914-Present	
HIST 338	Modern Latin America	
HIST 341	Modern Central America	
Select from the following Sociology courses:		4
SOC 309	The World System and Its Problems	
SOC 315	Global Race and Ethnic Relations	
SOC 316	American Ethnic Minorities	
Total units		20

¹ If course is taken to meet a requirement in the major, it may not be double-counted in the concentration.

Mathematics Concentration

MATH 141	Calculus I	4
MATH 142	Calculus II	4
MATH 143	Calculus III	4
MATH 248	Methods of Proof in Mathematics	4
Select from the following:		4
LS 305	Project Based Learning in STEM Education	
MATH 300	Technology in Mathematics Education	
MATH 335	Graph Theory	
MATH 336	Combinatorial Math	
MATH 341	Theory of Numbers	
MATH 419	Introduction to the History of Mathematics	
MATH 442	Euclidean Geometry	

STAT 410	Statistics Education: Pedagogy, Content, Technology, and Assessment
----------	---

Total units	20
-------------	----

Science Concentration

Students must take at least one course at the 300-400 level in the concentration; three courses in the same discipline are recommended.

Chemistry Requirement

Select from the following:		4-5
CHEM 111	Survey of Chemistry	
CHEM 124	General Chemistry for Physical Science and Engineering I	
CHEM 127	General Chemistry for Agriculture and Life Science I	

Physics Requirement

Select from the following:		4
PHYS 107	Introduction to Meteorology	
PHYS 111	Contemporary Physics for Nonscientists	
PHYS 121	College Physics I	
PHYS 141	General Physics IA	
PSC 320	Energy, Society and the Environment	

Approved Concentration Electives

Select from the following:		11-12
ASTR 102	Introduction to Stars and Galaxies	
ASTR 324	Longitude, Navigation, and Timekeeping	
BIO 114	Plant Diversity and Ecology	
BIO/CHEM 202	Orientation to Biotechnology	
BIO 231	Human Anatomy and Physiology I	
BIO 232	Human Anatomy and Physiology II	
BIO 302	Human Genetics	
BIO 305	Biology of Cancer	
BIO/CHEM 308	Genetic Engineering Technology	
BOT 311	Plants, People and Civilization	
BOT 326	Plant Ecology	
CHEM 125	General Chemistry for Physical Science and Engineering II	
CHEM 126	General Chemistry for Physical Science and Engineering III	
CHEM 128	General Chemistry for Agriculture and Life Science II	
CHEM 129	General Chemistry for Agriculture and Life Science III	
CHEM 312	Survey of Organic Chemistry	
CHEM 313	Survey of Biochemistry and Biotechnology	
CHEM 349	Chemical and Biological Warfare	
CHEM 377	Chemistry of Drugs and Poisons	
CHEM 466	Learning Assistant Seminar ¹	
ERSC 223	Rocks and Minerals	
GEOL 102	Introduction to Geology	

GEOL 203	Fossils and the History of Life
GEOL 205	Earthquakes
GEOL 206	Geologic Excursions
LS 305	Project Based Learning in STEM Education ²
MCRO 221	Microbiology
MSCI 307	World Aquaculture: Applications, Methodologies and Trends
MSCI 330	Technologies for Ocean Discovery
MSCI 440	Communicating Ocean Sciences to Informal Audiences
NR 306	Natural Resource Ecology and Habitat Management
PHYS 122	College Physics II
PHYS 123	College Physics III
PHYS 132	General Physics II
PHYS 133	General Physics III
PHYS 330	Teaching Physics
PSC 201	Physical Oceanography
SCM 302/ ENGR 322	The Learn By Doing Lab Teaching Practicum ¹
SCM 360	Selected Environmental Issues of California's Central Coast
<hr/>	
Total units	20

¹ A maximum of 4 units total from CHEM 466 and SCM 302 may be used in the concentration.

² A maximum of 4 units total of LS 305 may be used in the concentration.

Spanish Concentration

SPAN 202	Intermediate Spanish II	4
SPAN 203 or SPAN 206	Intermediate Spanish III Spanish for Heritage Speakers	4
SPAN 233	Introduction to Hispanic Readings (C1) ¹	4
Select from the following:		8
EDUC 405	Social, Historical and Cultural Influences on Latino/a Students in Education	
SPAN 301	Advanced Composition in Spanish	
SPAN 302	Advanced Conversation and Composition in Spanish	
SPAN 303	Introduction to English-Spanish Translation	
SPAN 305	Significant Works in Spanish (C4)	
SPAN 307	Spanish and Latin American Film (C4)	
SPAN 340	Chicano/a Authors (C4, USCP)	
SPAN 350	Hispanic Literature in English Translation (C4)	
SPAN 351	Chicano/Latino Writers in the United States (C4, USCP)	
SPAN 390	Introduction to Creative Writing in Spanish	

SPAN 402	Advanced Topics in Spanish Linguistics
SPAN 410	Advanced Literature in Spanish
SPAN 416	Don Quixote
SPAN 470	Selected Advanced Topics
WLC 310	Humanities in World Cultures (C4)
WLC 312	Humanities in Chicano/a Culture (C4, USCP)
WLC 470	Selected Advanced Topics
<hr/>	
Total units	20

¹ Required in Concentration; also satisfies GE.

Teaching English as a Second Language Concentration

COMS 316	Intercultural Communication (D5,USCP)	4
ENGL 290 or ENGL 390	Introduction to Linguistics ¹ The Linguistic Structure of Modern English	4
ENGL 497	Theories of Language Learning and Teaching	4
ENGL 498	Approaches to Teaching English as a Second Language/Dialect	4
ENGL 499	Practicum in Teaching English as a Second Language/Dialect	2
<hr/>		
Total units		18

¹ Both ENGL 290 and ENGL 390 are required for the TESL certification.

Mathematics

Faculty Offices East Bldg. (25), Room 208

Phone: 805.756.2206

<https://math.calpoly.edu>

Department Chair: Joseph E. Borzellino

Academic Programs

Program name	Program type
Mathematics	BS, MS, Minor

The Mathematics Department offers a comprehensive undergraduate program of courses leading to a Bachelor of Science degree in mathematics. It also offers a program of courses for students who wish to minor in mathematics, as well as graduate courses for programs of study leading to a Master of Science degree. The mix of pure and applied mathematics in these courses increases both the usefulness of and the demand for graduates with a degree in mathematics. In addition, the Mathematics Department offers courses that serve all departments in the university.

The rich variety of courses in the Mathematics department provides students with the opportunity to experience those fields and the techniques of mathematics that are most useful in the physical sciences, engineering, statistics and business. Examples include mathematical modeling, mathematical biology, data analysis, operations research, fluid dynamics, numerical analysis, financial mathematics and sustainability.

Satisfactory completion of the Entry Level Mathematics (ELM) requirement is a prerequisite for enrollment in all mathematics courses except MATH 92 and MATH 96. For additional mathematics placement (MAPE) information visit the Academic Standards and Policies (p. 44) section.

Undergraduate Programs

BS Mathematics

The undergraduate program for math majors contains a central core of courses. These courses give a solid basis for advanced work that is tailored to fit the needs and objectives of each individual student. Advanced coursework is chosen in close consultation with faculty advisors.

Concentrations

The General Curriculum in Mathematics is not a concentration, and is the default curriculum required for students who do not declare a concentration. The general curriculum and all of the concentrations provide a strong mathematical foundation for the student contemplating the pursuit of a graduate degree in mathematics.

Applied Mathematics

Provides a curriculum with an emphasis on applications to the physical sciences and engineering. This concentration benefits students who are interested in the use of mathematics in areas such as engineering, data analytics, physics, aeronautics, finance, actuarial science, biology, medicine, and the geosciences. Potential career paths include pursuit of advanced degrees in any of the above fields or in applied mathematics, as well as industry jobs in a broad range of areas in which physical processes are modeled or analyzed using the tools of mathematics.

Mathematics Teaching

Students wishing to prepare for a career teaching mathematics in middle or senior high school should choose the concentration in teaching. The courses in the concentration, coupled with the other required courses in the major, fulfill the prerequisites for the California Commission on Teacher Credentialing.

Pure Mathematics

A broad and rigorous curriculum designed both for students who will pursue an advanced degree in mathematics as well as those who choose careers requiring significant mathematical training. Graduates of the program are well prepared to enter graduate programs in mathematics and capable of bringing a broad range of mathematical skills and expertise to a wide range of professional careers.

Mathematics Minor

Students may earn a minor in mathematics by completing a coordinated program of study. The program consists of a core of required courses, followed by four advanced courses coordinated with a student's career objectives. Interested students should contact the Mathematics Department for individual advisement.

Graduate Program

Master of Science Degree in Mathematics

General Characteristics

The master of science program in mathematics prepares students to enter careers in industry, teaching at the community college level, or to prepare for entering a PhD program in pure or applied mathematics.

Prerequisites

General CSU minimum qualifications for students entering a Master's degree program include a bachelor's degree from an accredited institution with a minimum grade point average of 2.5 in the last 90 quarter units attempted.

Generally the Mathematics department at Cal Poly expects incoming Master's degree students to have a grade point average of 3.0 or higher, and preferably a major in mathematics. Applicants without a major in mathematics are still welcome to apply, but must have substantial exposure to upper level mathematics courses. Such applicants may be subject to acceptance conditional upon completion of remaining standard undergraduate mathematics curricula.

Program of Study

The Master's program requires 45 units of coursework and a culminating oral exam. There are nine 500 level courses that are required of all graduating Master's students in mathematics. Two of these courses have prerequisites qualifying exams, each offered twice a year.

Blended BS+MS Mathematics

The blended program provides motivated students with an efficient way to complete a BS and MS in mathematics with both degrees being conferred simultaneously. Students are provided with ample advising to ensure a seamless transition from undergraduate to graduate status.

Eligibility

Cal Poly students interested in applying for the blended program are expected to have a 3.3 grade point average or higher, to have completed

some upper division coursework, and should be on or ahead of track to finish their undergraduate degree. Students normally apply during their senior year. Interested students should arrange to meet with the Graduate Coordinator to discuss when and how to apply.

Program of Study

Students must complete the requirements of both the undergraduate and master's program of study for a total of 225 units. They are advised to take undergraduate courses suitable for preparation for graduate studies in mathematics, including several 400 level courses in linear and abstract algebra and real analysis.

BS Mathematics

Program Learning Objectives

1. Understand the nature of mathematical proof and be able to write clear and concise proofs.
2. Develop the ability to read, understand, and use basic definitions in linear and abstract algebra and real analysis, and be able to prove simple consequences of these definitions.
3. Be able to use standard mathematical techniques to solve elementary problems.
4. Be able to communicate effectively in oral and written form.
5. Be able to write simple computer programs to perform mathematical computations.
6. Gain experience exploring open-ended problems, learn to make conjectures, and gather evidence to support or refute these conjectures.
7. Develop the ability to read and to learn mathematics independently.
8. Learn about applications of mathematics in other fields and gain experience in mathematical modeling.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

MATH 141	Calculus I (B1) ¹	4
MATH 142	Calculus II (B1) ¹	4
MATH 143	Calculus III	4
MATH 202	Orientation to Mathematics Major	1
MATH 206	Linear Algebra I	4
MATH 241	Calculus IV	4
MATH 242	Differential Equations I	4
MATH 248	Methods of Proof in Mathematics	4
MATH 306	Linear Algebra II	4
MATH 336	Combinatorial Math	4
MATH 412	Introduction to Analysis I	4

Select from the following: ³		4
MATH 459	Senior Project Seminar	
MATH 460	Senior Project Applied Seminar	
MATH 461 & MATH 462	Senior Project I and Senior Project II	
MATH 481	Abstract Algebra I	4
CSC/CPE 101	Fundamentals of Computer Science	4
PHYS 141	General Physics IA	4
Select from the following: ¹		4
PHYS 132	General Physics II (B3 & B4)	
PHYS 133	General Physics III (B3 & B4)	
General Curriculum in BS Mathematics or Concentration ²		44/56/48/48
GENERAL EDUCATION (GE)		
(See GE program requirements below.)		60
FREE ELECTIVES		
Free Electives ²		15/3/11/11
Total units		180

¹ Required in Major; also satisfies GE.

² General Curriculum/Applied Concentration/Pure Concentration/Mathematics Teaching Concentration.

³ MATH 460 is recommended for students in the Applied Concentration.

General Curriculum in BS Mathematics or Concentrations (select one)

- General Curriculum (p. 378)
- Applied Mathematics (p. 379)
- Mathematics Teaching (p. 380)
- Pure Mathematics (p. 380)

General Education (GE) Requirements

- 72 units required, 12 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Major/Support) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Support) ¹	0
B4	One lab taken with either a B2 or B3 course ¹	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4

Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		60

¹ Required in Major; also satisfies GE.

General Curriculum in Mathematics

This is the default curriculum required for students who do not declare a concentration.

STAT 301	Statistics I	4
or STAT 305	Introduction to Probability and Simulation	
or STAT 425	Probability Theory	

Tracks

Choose three tracks from the following list, with at least one track chosen from the first four tracks listed. A track consists of two paired courses representing depth of study with a particular focus. ¹

MATH 413 & MATH 414	Introduction to Analysis II and Introduction to Analysis III	
MATH 482 & MATH 483	Abstract Algebra II and Abstract Algebra III	
MATH 406 & MATH 413 or MATH 440	Linear Algebra III and Introduction to Analysis II Topology I	
MATH 482 & MATH 413 or MATH 440	Abstract Algebra II and Introduction to Analysis II Topology I	
MATH 304 & MATH 404	Vector Analysis and Introduction to Differential Geometry	
MATH 335 & MATH 435	Graph Theory and Discrete Mathematics with Applications I	
MATH 344 & MATH 416 or MATH 418	Linear Analysis II and Differential Equations II Partial Differential Equations	
MATH 350 & MATH 341 or MATH 344	Mathematical Software and Theory of Numbers Linear Analysis II	
MATH 408 & MATH 409	Complex Analysis I and Complex Analysis II	
MATH 437 & MATH 453	Game Theory and Numerical Optimization	
MATH 442 & MATH 443	Euclidean Geometry and Modern Geometries	

MATH 451 & MATH 452	Numerical Analysis I and Numerical Analysis II	
Select from the following approved electives:		16
CSC/CPE 202	Data Structures	
CSC/CPE 203	Project-Based Object-Oriented Programming and Design	
CSC 349	Design and Analysis of Algorithms	
MATH 304	Vector Analysis	
MATH 335	Graph Theory	
MATH 341	Theory of Numbers	
MATH 344	Linear Analysis II	
MATH 350	Mathematical Software	
MATH 404	Introduction to Differential Geometry	
MATH 406	Linear Algebra III	
MATH 408	Complex Analysis I	
MATH 409	Complex Analysis II	
MATH 413	Introduction to Analysis II	
MATH 414	Introduction to Analysis III	
MATH 416	Differential Equations II	
MATH 418	Partial Differential Equations	
MATH 419	Introduction to the History of Mathematics	
MATH 435	Discrete Mathematics with Applications I	
MATH 437	Game Theory	
MATH 440	Topology I	
MATH 442	Euclidean Geometry	
MATH 443	Modern Geometries	
MATH 451	Numerical Analysis I	
MATH 452	Numerical Analysis II	
MATH 453	Numerical Optimization	
MATH 459 or MATH 460	Senior Project Seminar Senior Project Applied Seminar	
MATH 461 & MATH 462	Senior Project I and Senior Project II	
MATH 470	Selected Advanced Topics	
MATH 475	Advanced Topics in Mathematics ²	
MATH 476	Advanced Topics in Applied Mathematics ²	
MATH 482	Abstract Algebra II	
MATH 483	Abstract Algebra III	
PHYS 132 or PHYS 133	General Physics II General Physics III	
PHYS 211	Modern Physics I	
PHYS 301	Thermal Physics I	
PHYS 302	Classical Mechanics I	
PHYS 322	Vibrations and Waves	
PHYS 323	Optics	
PHYS 405	Quantum Mechanics I	
PHYS 408	Electromagnetic Fields and Waves I	
STAT 301	Statistics I	
STAT 302	Statistics II	

STAT 305	Introduction to Probability and Simulation	
STAT 425	Probability Theory	
STAT 426	Estimation and Sampling Theory	
STAT 427	Mathematical Statistics	
Total units		44

¹ A single course cannot be used to satisfy multiple tracks.

² Maximum 8 units combined between MATH 475 and MATH 476.

Applied Mathematics Concentration

MATH 304	Vector Analysis	4
MATH 344	Linear Analysis II	4
MATH 350	Mathematical Software	4
or CSC/CPE 202	Data Structures	
MATH 408	Complex Analysis I	4
MATH 413	Introduction to Analysis II	4
MATH 416	Differential Equations II	4
or MATH 418	Partial Differential Equations	
MATH 451	Numerical Analysis I	4
STAT 301	Statistics I	4
or STAT 305	Introduction to Probability and Simulation	
or STAT 425	Probability Theory	

Tracks

Select courses from one of the following tracks. ^{1,2} 12

Track A

MATH 335	Graph Theory	
MATH 406	Linear Algebra III	
MATH 409	Complex Analysis II	
MATH 414	Introduction to Analysis III	
MATH 416	Differential Equations II	
MATH 418	Partial Differential Equations	
MATH 437	Game Theory	
MATH 452	Numerical Analysis II	
MATH 453	Numerical Optimization	
MATH 460	Senior Project Applied Seminar	
MATH 461 & MATH 462	Senior Project I and Senior Project II	
MATH 476	Advanced Topics in Applied Mathematics	

Track B

DATA 301	Introduction to Data Science	
DATA 401	Data Science	
MATH 335	Graph Theory	
or MATH 453	Numerical Optimization	

Approved Electives ³ 12

Select three courses in one of the following categories, with at least one course at the 300 level or above. ⁴

Physics Category:

ASTR 301	Planetary Systems	
ASTR 302	Stars and Galaxies	
ASTR 326	Cosmology	
PHYS 132	General Physics II	

or PHYS 133	General Physics III	
PHYS 211	Modern Physics I	
PHYS 301	Thermal Physics I	
PHYS 302	Classical Mechanics I	
PHYS 303	Classical Mechanics II	
PHYS 318	Special Theory of Relativity	
PHYS 322	Vibrations and Waves	
PHYS 323	Optics	
PHYS 405	Quantum Mechanics I	
PHYS 408	Electromagnetic Fields and Waves I	
PHYS 412	Solid State Physics	
PHYS 417	Nonlinear Dynamical Systems	

Statistics Category:

STAT 302	Statistics II	
STAT 305	Introduction to Probability and Simulation	
STAT 323	Design and Analysis of Experiments I	
STAT 330	Statistical Computing with SAS	
STAT 331	Statistical Computing with R	
STAT 334	Applied Linear Models	
STAT 416	Statistical Analysis of Time Series	
STAT 417	Survival Analysis Methods	
STAT 418	Categorical Data Analysis	
STAT 419	Applied Multivariate Statistics	
STAT 421	Survey Sampling and Methodology	
STAT 423	Design and Analysis of Experiments II	
STAT 425	Probability Theory	
STAT 426	Estimation and Sampling Theory	
STAT 427	Mathematical Statistics	

Computer Science Category:

CSC/CPE 202	Data Structures	
CSC/CPE 203	Project-Based Object-Oriented Programming and Design	
CSC 225	Introduction to Computer Organization	
CSC 349	Design and Analysis of Algorithms	
CSC/CPE 357	Systems Programming	
CSC 448	Bioinformatics Algorithms	

Mechanical Engineering Category:

ME 211	Engineering Statics	
ME 212	Engineering Dynamics	
ME 302	Thermodynamics I	
ME 326	Intermediate Dynamics	
ME 341	Fluid Mechanics I	

Economics Category:

ECON 311	Intermediate Microeconomics I	
ECON 312	Intermediate Microeconomics II	
ECON 313	Intermediate Macroeconomics	
ECON 403	Industrial Organization	
ECON 408	Mathematical Economics	

ECON 409	Probability Models for Economic Decisions	
Total units		56

- ¹ Only students in the Applied Concentration who are pursuing a Data Science minor should select Track B.
- ² Students who select Track B should select the Statistics Category for their approved electives.
- ³ Consultation with advisor is recommended prior to selecting approved electives; bear in mind your selections may impact pursuit of post-baccalaureate studies and/or goals.
- ⁴ Other choices are also possible, and should be pre-approved in consultation with academic advisor. Approved electives are to be taken outside of the Mathematics department and should have significant applications to mathematics.

Mathematics Teaching Concentration

MATH 300	Technology in Mathematics Education	4
MATH 341	Theory of Numbers	4
MATH 419	Introduction to the History of Mathematics	4
MATH 423	Advanced Mathematics for Teaching	4
MATH 442	Euclidean Geometry	4
MATH 443	Modern Geometries	4
MATH 482	Abstract Algebra II	4
SCM 300	Early Field Experience ¹	4
STAT 301	Statistics I	4
STAT 302	Statistics II	4
or STAT 305	Introduction to Probability and Simulation	
or STAT 425	Probability Theory	
Select from the following:		8
CSC/CPE 202	Data Structures	
MATH 304	Vector Analysis	
MATH 335	Graph Theory	
MATH 344	Linear Analysis II	
MATH 406	Linear Algebra III	
MATH 408	Complex Analysis I	
MATH 413	Introduction to Analysis II	
MATH 416	Differential Equations II	
MATH 435	Discrete Mathematics with Applications I	
MATH 437	Game Theory	
MATH 440	Topology I	
MATH 451	Numerical Analysis I	
MATH 459	Senior Project Seminar	
or MATH 460	Senior Project Applied Seminar	
MATH 461 & MATH 462	Senior Project I and Senior Project II	
MATH 470	Selected Advanced Topics	
PHYS 132	General Physics II	
or PHYS 133	General Physics III	

PHYS 302	Classical Mechanics I	
Total units		48

- ¹ SCM 300 requires 45 hours of observations at local schools. Students should plan their schedules to have a four-hour block free during elementary school hours each week.

Pure Mathematics Concentration

MATH 408	Complex Analysis I	4
MATH 413	Introduction to Analysis II	4
MATH 440	Topology I	4
MATH 482	Abstract Algebra II	4
Select from the following:		12
MATH 406	Linear Algebra III	
MATH 409	Complex Analysis II	
MATH 414	Introduction to Analysis III	
MATH 435	Discrete Mathematics with Applications I	
MATH 483	Abstract Algebra III	
Select from the following:		4
MATH 350	Mathematical Software	
STAT 301	Statistics I	
or STAT 305	Introduction to Probability and Simulation	
or STAT 425	Probability Theory	
Select from the following:		16
MATH 304	Vector Analysis	
MATH 335	Graph Theory	
MATH 341	Theory of Numbers	
MATH 344	Linear Analysis II	
MATH 350	Mathematical Software	
MATH 404	Introduction to Differential Geometry	
MATH 406	Linear Algebra III	
MATH 409	Complex Analysis II	
MATH 414	Introduction to Analysis III	
MATH 416	Differential Equations II	
MATH 418	Partial Differential Equations	
MATH 435	Discrete Mathematics with Applications I	
MATH 437	Game Theory	
MATH 451	Numerical Analysis I	
MATH 452	Numerical Analysis II	
MATH 453	Numerical Optimization	
MATH 459	Senior Project Seminar	
or MATH 460	Senior Project Applied Seminar	
MATH 461 & MATH 462	Senior Project I and Senior Project II	
MATH 470	Selected Advanced Topics	
MATH 475	Advanced Topics in Mathematics	
MATH 483	Abstract Algebra III	
Total units		48

Mathematics Minor

Required Courses

MATH 143	Calculus III	4
MATH 206	Linear Algebra I	4
or MATH 244	Linear Analysis I	
MATH 248	Methods of Proof in Mathematics	4

Approved Electives

Select from the following (at most two 300-level courses): 16

MATH 304	Vector Analysis
MATH 306	Linear Algebra II
MATH 335	Graph Theory
MATH 336	Combinatorial Math
MATH 341	Theory of Numbers
MATH 344	Linear Analysis II
MATH 404	Introduction to Differential Geometry
MATH 406	Linear Algebra III
MATH 408	Complex Analysis I
MATH 409	Complex Analysis II
MATH 412	Introduction to Analysis I
MATH 413	Introduction to Analysis II
MATH 414	Introduction to Analysis III
MATH 416	Differential Equations II
MATH 418	Partial Differential Equations
MATH 435	Discrete Mathematics with Applications I
MATH 437	Game Theory
MATH 440	Topology I
MATH 442	Euclidean Geometry
MATH 443	Modern Geometries
MATH 451	Numerical Analysis I
MATH 452	Numerical Analysis II
MATH 453	Numerical Optimization
MATH 481	Abstract Algebra I
MATH 482	Abstract Algebra II
MATH 483	Abstract Algebra III

Total units 28

MATH 531	Discrete Mathematics with Applications II	4
MATH 540	Topology I	4
MATH 541	Topology II	4
MATH 550	Real Analysis	4
MATH 560	Field Theory	4
MATH 561	Graduate Algebra	4
Electives		9

Select additional units at the 400 or 500 level as approved by the Graduate Committee.

Satisfactory completion of the comprehensive examinations.

Total units 45

MS Mathematics

Program Learning Objectives

1. Demonstrate a high level of overall mathematical knowledge in the traditional areas of advanced mathematics, including algebra, analysis, topology, and discrete mathematics.
2. Apply mathematical knowledge in new settings.
3. Produce detailed, rigorous, and correct proofs.
4. Communicate effectively in oral and written forms.

Required Courses

MATH 520	Applied Analysis I	4
MATH 521	Applied Analysis II	4
MATH 530	Discrete Mathematics with Applications I	4

Physics

Baker Center for Science and Mathematics Bldg. (180), Room 204
Phone: 805.756.2448; Fax: 805.756.2435
<http://physics.calpoly.edu/>
physics@calpoly.edu

Department Chair: Robert Echols

Academic Programs

Program name	Program type
Physics	BA, BS, Minor
Astronomy	Minor
Geology	Minor

The department provides a solid grounding in fundamental physics through theoretical courses in Classical and Modern Physics, Quantum Mechanics, Electromagnetism, and Thermal Physics. These are supported by a comprehensive laboratory program in electronics and quantum physics. Required subjects are complemented by a wide range of elective courses including optics, particle and solid state physics, nonlinear dynamics, astronomy, and geophysics. Facilities include specialized laboratories in electrical measurements, optics, solid state physics, and nuclear and atomic physics. Majors are prepared to attend graduate school, work in technical fields, or pursue a teaching credential. Student activities include a chapter of the national Society of Physics Students and a chapter of the national physics honor society, Sigma Pi Sigma.

Undergraduate Programs

BA Physics

The BA in Physics provides the student with a solid foundation in physics. It is a more flexible major serving students with double majors, nontechnical minors, and students who intend to pursue pre-college teaching. The curriculum has fewer required courses than the BS, which allows students to choose from an extensive list of electives. Tailoring the curriculum to maximize student goals should be done in consultation with an academic advisor. Students considering a career in teaching should consult with their academic advisor early.

BS Physics

The BS in Physics is the appropriate choice for those students planning a career involving physics in industry or government laboratories, as well as those seeking a strong foundation in physics for graduate study.

Astronomy Minor

The Astronomy Minor provides students an opportunity to learn about and analyze astronomical phenomena and processes. A minor in astronomy provides a background for graduate-level studies in astronomy or work in related fields. Interested students should see an Astronomy Minor advisor.

Geology Minor

The Geology Minor is offered in conjunction with the Natural Resources Management and Environmental Sciences Department. It provides

a background useful for careers in environmental consulting or geotechnical fields. Interested students should consult with a Geology Minor advisor. This minor is not open to students in the Earth Sciences' Geology concentration. For more information about that concentration, please see the Earth Sciences program in the Natural Resources Management and Environmental Sciences Department (p. 127).

Prerequisites for the Geology minor are SS 121, CHEM 111 or CHEM 128, and PHYS 132.

Physics Minor

The Physics Minor provides students with the opportunity to build on their introductory physics courses with a coordinated set of electives based on interests and career objectives selected in consultation with a physics advisor.

Students may earn a minor in Physics by completing a course of study consisting of 24 units in physics and astronomy, of which 12 units must be upper division, and no more than 4 units may be from astronomy courses.

BA Physics

Program Learning Objectives

1. Demonstrate a good understanding of both the theoretical concepts and mathematical techniques of the major fields of physics: classical mechanics, electromagnetism, thermodynamics, and quantum physics.
2. Work safely with modern laboratory equipment to carry out measurements and analyze data.
3. Use computers to perform numerical computations, to simulate physical phenomena, and to collect and analyze data in the laboratory.
4. Communicate effectively, both orally and in writing.
5. Move successfully into graduate school or a career in teaching or industry.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major courses with a lab component may be selected as credit/no credit.¹

MAJOR COURSES

PHYS 141	General Physics IA	4
PHYS 132	General Physics II (B3 & B4) ^{1,2}	4
PHYS 133	General Physics III ¹	4
PHYS 206 or PHYS 202	Experimental Physics ¹ Physics on the Computer	4
PHYS 211	Modern Physics I	4
PHYS 212	Modern Physics II	4

PHYS 301	Thermal Physics I	4
PHYS 302	Classical Mechanics I	4
PHYS 322	Vibrations and Waves	3
PHYS 405	Quantum Mechanics I	4
PHYS 408	Electromagnetic Fields and Waves I	4
PHYS 461	Senior Project I	2
or PHYS 463	Senior Project - Laboratory Research I	
MATH 141	Calculus I (B1) ²	4
MATH 142	Calculus II (B1) ²	4
MATH 143	Calculus III	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
MATH 304	Vector Analysis	4

Upper-division Electives

Select from the following: 23

Laboratory ElectivesSelect one from the following: ^{1,4}

ASTR 444	Observational Astronomy	
PHYS 323	Optics	
PHYS 340	Quantum Physics Laboratory I	
PHYS 341	Quantum Physics Laboratory II	
PHYS 357	Advanced Instrumentation in Experimental Physics	
PHYS 417	Nonlinear Dynamical Systems	
PHYS 422	Polymer Electronics Laboratory	
PHYS 423	Advanced Optics	
PHYS 452	Solid State Physics Laboratory	

Technical ElectivesSelect 15 units from the following: ^{1,3,5}

Any 300-400 level courses with PHYS, ASTR, or GEOL prefix	
OR one of the following:	
HIST 350	The Scientific Revolution, c. 1500-1800
PHIL 321	Philosophy of Science
PHIL 421	Philosophy of Space, Time and Matter
SCM 451	Ethics in the Sciences

Breadth Electives

Select 7 units from any 300-400 level course.

GENERAL EDUCATION (GE)

(See GE program requirements below.) 60

FREE ELECTIVES

Free Electives (CHEM 124 & CHEM 125 recommended)	28
Total units	180

¹ Major courses with lab component may not be taken as CR/NC grading:
PHYS 132, PHYS 133, PHYS 206, PHYS 323, PHYS 340, PHYS 341, PHYS 342, PHYS 357, PHYS 417, PHYS 422, PHYS 423, PHYS 452, ASTR 444.

² Required in Major; also satisfies GE.

³ Total combined elective credit in PHYS 400, PHYS 404, ASTR 400, ASTR 404, GEOL 400, and GEOL 404 limited to 8 units, with a maximum of 2 units per quarter.

⁴ Units in excess of 1 unit will count towards Technical Elective units.

⁵ Excess units will count toward Breadth Elective units.

General Education (GE) Requirements

- 72 units required, 12 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Major) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Major) ¹	0
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		60

¹ Required in Major; also satisfies GE.

BS Physics

Program Learning Objectives

1. Demonstrate a good understanding of both the theoretical concepts and mathematical techniques of the major fields of physics: classical mechanics, electromagnetism, thermodynamics, and quantum physics.
2. Work safely with modern laboratory equipment to carry out measurements and analyze data.
3. Use computers to perform numerical computations, to simulate physical phenomena, and to collect and analyze data in the laboratory.
4. Communicate effectively, both orally and in writing.

5. Move successfully into graduate school or industry.

Degree Requirements and Curriculum

In addition to the program requirements on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses
- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No major course with a lab component may be selected as credit/no credit.¹

MAJOR COURSES

PHYS 141	General Physics IA	4
PHYS 132	General Physics II (B3 & B4) ^{1,2}	4
PHYS 133	General Physics III ¹	4
PHYS 202	Physics on the Computer	4
PHYS 206	Experimental Physics ¹	4
PHYS 211	Modern Physics I	4
PHYS 212	Modern Physics II	4
PHYS 301	Thermal Physics I	4
PHYS 302	Classical Mechanics I	4
PHYS 322	Vibrations and Waves	3
PHYS 340	Quantum Physics Laboratory I ¹	2
PHYS 341	Quantum Physics Laboratory II ¹	2
PHYS 405	Quantum Mechanics I	4
PHYS 408	Electromagnetic Fields and Waves I	4
PHYS 461	Senior Project I	2
or PHYS 463	Senior Project - Laboratory Research I	
PHYS 462	Senior Project II	2
or PHYS 464	Senior Project - Laboratory Research II	
CHEM 124	General Chemistry for Physical Science and Engineering I	4
CHEM 125	General Chemistry for Physical Science and Engineering II	4
MATH 141	Calculus I (B1) ²	4
MATH 142	Calculus II (B1) ²	4
MATH 143	Calculus III	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
MATH 304	Vector Analysis	4
MATH 344	Linear Analysis II	4

Technical Electives

Select from the following: 21

Mathematical Physics Elective ⁷

- PHYS 424 Theoretical Physics
- or MATH 418 Partial Differential Equations

Physics Electives ^{1, 3, 4, 5, 6, 8}

Select 11 units from the following:

- Any 300-400 level PHYS prefix course, or ASTR 444;
- And two courses must be labs selected from:
- ASTR 444 Observational Astronomy

PHYS 323	Optics
PHYS 342	Quantum Physics Laboratory III
PHYS 357	Advanced Instrumentation in Experimental Physics
PHYS 417	Nonlinear Dynamical Systems
PHYS 422	Polymer Electronics Laboratory
PHYS 423	Advanced Optics
PHYS 452	Solid State Physics Laboratory

Breadth Electives ^{1, 3, 4, 5, 6}

Select 7 units from the following:

- Any 300-400 level PHYS, ASTR, GEOL, MATH, STAT or CSC, or CSC 101, CSC 231, CSC 234, CSC 235 (excludes ASTR 324, CSC 302, CSC 310).

GENERAL EDUCATION (GE)

(See GE program requirements below.) 60

FREE ELECTIVES

Free Electives	8
Total units	180

- ¹ Major courses with lab component may not be taken as CR/NC grading:
PHYS 132, PHYS 133, PHYS 206, PHYS 323, PHYS 340, PHYS 341, PHYS 342, PHYS 357, PHYS 417, PHYS 422, PHYS 423, PHYS 452, ASTR 444.
- ² Required in Major; also satisfies GE.
- ³ For students anticipating an industrial career, PHYS 323, PHYS 357, PHYS 412, PHYS 413, PHYS 423, and PHYS 452 are suggested.
- ⁴ For students anticipating graduate work in physics, PHYS 303, PHYS 401, PHYS 406, PHYS 409, PHYS 424, and MATH 408 are suggested. PHYS 357 is suggested for students who anticipate becoming experimental physicists.
- ⁵ Total combined elective credit in PHYS 400, PHYS 404, ASTR 400, ASTR 404, GEOL 400, and GEOL 404 limited to 8 units, with a maximum of 2 units per quarter.
- ⁶ ASTR 444 can be used only once in the technical electives. If used to meet the Laboratory Technical Elective, excess units will go into Physics or Breadth Electives.
- ⁷ Units in excess of 3 units will count towards Physics Elective units.
- ⁸ Excess units will count towards Breadth Elective units.

General Education (GE) Requirements

- 72 units required, 12 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Major) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Major) ¹	0

B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		60

¹ Required in Major; also satisfies GE.

Astronomy Minor

Required Courses

PHYS 132	General Physics II	4
PHYS 133	General Physics III	4
PHYS 211	Modern Physics I	4
ASTR 301	Planetary Systems	3
ASTR 302	Stars and Galaxies	3
ASTR 326	Cosmology	3
ASTR 444	Observational Astronomy	4

Select from the following: 3-4

ASTR 470	Selected Advanced Topics
ASTR 471	Selected Advanced Laboratory
AERO 351	Introduction to Orbital Mechanics
GEOL 415	Structural Geology
PHYS 302	Classical Mechanics I
PHYS 303	Classical Mechanics II
PHYS 313	Introduction to Atmospheric Physics
PHYS 318	Special Theory of Relativity
PHYS 323	Optics
PHYS 410	Physics of Solid Earth

Total units 28-29

Geology Minor

Required Courses

ERSC 223	Rocks and Minerals	4
ERSC 323	Geomorphology	4
GEOL 201	Physical Geology	3
GEOL 241	Physical Geology Laboratory	1
GEOL 305	Fundamentals of Seismology	4
GEOL/ERSC 401	Field-Geology Methods	4
GEOL/ERSC 402	Geologic Mapping	4

GEOL 415	Structural Geology	4
Total units		28

Physics Minor

Required Courses

PHYS 133	General Physics III	4
PHYS 211	Modern Physics I	4

Physics/Astronomy Electives ¹ 16

Any upper division PHYS course (300-400 level) or...

PHYS 202 Physics on the Computer
or PHYS 212 Modern Physics II

Must include at least one of the following courses:

PHYS 301 Thermal Physics I
PHYS 302 Classical Mechanics I
PHYS 322 Vibrations and Waves
PHYS 323 Optics

PHYS 405 Quantum Mechanics I
PHYS 408 Electromagnetic Fields and Waves I
PHYS 412 Solid State Physics

Students may also select a maximum of 4 units from:

ASTR 301 Planetary Systems
ASTR 302 Stars and Galaxies
ASTR 326 Cosmology
ASTR 444 Observational Astronomy

Total units 24

¹ A minimum of 12 units must be upper division.

School of Education

Education Bldg. (02), Room 120
805.756.2126
<https://soe.calpoly.edu>
soe@calpoly.edu

Director: J. Kevin Taylor

Academic Programs

Program name	Program type
Curriculum and Instruction	MA
Education	MA
Educational Leadership and Administration	MA
Higher Education Counseling and Student Affairs	MS
Special Education	MS

Vision, Mission and Programs

Vision: The School of Education programs support the development of qualified, competent, and caring education professionals who prepare a diverse student population to become active and thoughtful participants in a democratic society.

Mission: The School of Education leads the campus in an all-university approach to preparing education professionals. These professionals create, assess and modify environments, practices, and policies to foster the achievement of each and every learner; they strive for equity in schools and society; and they are committed to inquiry and professional growth for themselves and the advancement of P-20 education.

School of Education faculty model leadership in their teaching, scholarship, and service through a grounded, reflective *learn-by-doing* approach and through sustained collaborations with their education partners: P-12 schools, families, community colleges, universities, and local, state, and national agencies.

Learning Outcomes: All candidates who complete a credential or master’s degree in the School of Education will:

- *Be Qualified, Competent, and Caring Professional Educators*
- *Integrate Principles and Practices of Professional Fields to Support Student Learning*
- *Engage in Cross-Disciplinary and Collaborative Practices*
- *Demonstrate Authentic Assessment Practices Designed for Student Success, Individual Growth, and Program Improvement*
- *Effect Sustainable Communities in a Multicultural Environment*
- *Engage in Professional Practices*

Programs: The School offers a wide variety of courses and programs leading to careers in education. Common to all programs is a commitment to excellence, to partnerships and collaboration, and to preparation for future educational challenges. As the state’s population grows, enrollments in grades P–12 increase and with them the demand for well-prepared teachers, and for specialists in administration, special education, and counseling/guidance.

To meet the need for excellence in the field, the School seeks talented, creative students who are committed to a long-term career in education and to the improvement of educational processes and institutions.

The School offers programs that lead to a preliminary credential in Multiple Subject or Single Subject teaching, in Administrative Services or as an Education or Agriculture Specialist. Supplementary and subject matter authorizations are available in a variety of subject areas.

The School offers multiple master’s degrees; see the Graduate (p. 387) section for more information.

Stressing the “learn by doing” philosophy, the School provides opportunities for extensive on-site observation, tutoring, and fieldwork in educational settings. Cal Poly maintains cooperative relations with surrounding school districts and area educational agencies. Within our service area, teacher candidates and master’s students can learn in cross-cultural, city and rural settings.

Teacher Education

Education Bldg. (02), Room 120
805.756.2126

The following credential programs are accredited by the California Commission on Teacher Credentialing (CTC) to prepare candidates and recommend for these credentials.

Teaching Credential Programs

- Agriculture Specialist
- Multiple Subject
- Single Subject: Agriculture
- Single Subject: Biological Science
- Single Subject: Chemistry
- Single Subject: English
- Single Subject: Geosciences
- Single Subject: Mathematics
- Single Subject: Physics
- Single Subject: Social Science
- Single Subject: World Languages – French
- Single Subject: World Languages – Spanish
- Bilingual Authorization: Spanish
- Education Specialist: Mild/Moderate Disabilities (see Graduate section in School of Education)

Credential programs consist of coursework and field experiences, including the clinical practice known as student teaching, that are required to obtain a preliminary teaching credential in California. Coursework in credential programs in the state of California is required to fit within one year of full-time study. In some instances, candidates are able to take prerequisite courses and enter a credential program prior to the completion of their undergraduate degree.

Application deadlines are established for each specific program. Detailed information about application deadlines and other requirements is available on the School of Education website at <https://soe.calpoly.edu>.

Multiple Subject Teaching

A multiple subject teaching credential permits someone to teach all subjects in a self-contained classroom (the context of elementary schools) up to the 8th grade, and Cal Poly’s Multiple Subject Teacher Preparation (MSTEP) Program prepares students to earn this credential. Entry to MSTEP requires completion of an undergraduate degree, but prerequisite coursework can be taken either as part of an undergraduate

degree or at the post-baccalaureate level. Some prerequisite courses have specific requirements for enrollment (e.g. senior or graduate standing); hence, early advising is critical and interested individuals are encouraged to contact the School of Education Credential Office for this purpose.

During the MSTEP Program candidates take courses in methods of teaching specific subjects, and they engage in clinical practice (student teaching) in elementary school classrooms and participate in seminar courses designed to bridge university- and school-based learning experiences. Special attention is paid to learning how to teach young students whose first language is not English, so a credential earned from the MSTEP Program is designated as English learner authorized. Detailed information about steps to apply to the MSTEP Program and state requirements for a Multiple Subject Teaching Credential can be found on the School of Education website at <https://soe.calpoly.edu>.

Single Subject Teaching

The Single Subject Teaching Credential is for candidates who wish to teach a specific content area at the secondary level. Single subject candidates must demonstrate subject matter competency by completing an approved subject matter course work program in that subject matter area or provide evidence of passing the appropriate California Subject Examinations for Teachers (CSET) specialty area test(s). Demonstration of subject matter competency must be completed before candidates begin the credential program.

Candidates for the Single Subject teaching credential in Agriculture or the Agricultural Specialist credential complete their preparation program through the Agricultural Education and Communication Department at Cal Poly and should communicate with the department credential advisor for further information or advisement (Dr. Ben Swan, at 805-756-2401 or bswan@calpoly.edu).

NOTE: Credential requirements are subject to change. Please check with program advisors for up-to-date information.

Admission Requirements

Details concerning specific requirements are available from the appropriate advisor, the advisement handbook, or at <https://soe.calpoly.edu>.

The requirements for admission to Cal Poly to pursue a Multiple Subject credential differ slightly from those for the Single Subject credential. All applicants must first apply for admission to graduate studies in Education at Cal Poly by completing an application at <http://www.calstate.edu/apply> (<https://calstate.edu/apply>).

Preliminary Credential

California has a two-tiered credentialing system. Initial credentialing to be a teacher requires earning a *preliminary* credential. Cal Poly programs provide a route to this credential and it allows a person to be hired as a classroom teacher in public schools in California. Contact the School of Education Credential Office for program-specific admission requirements, which include obtaining a Certificate of Clearance.

To make successful progress through a credential program, teacher candidates must maintain a B average in all professional education courses (MSTEP Program) or each a B or better in all professional education courses (Single Subject Program). Candidates must also complete additional application steps at specified transition points.

Check with the pertinent credential program advisor, handbook, and/or website (see <https://soe.calpoly.edu>) to determine all requirements to be completed for a specific credential program. A teacher candidate must provide evidence of completion of all state- and program-mandated requirements, and have that verified by the SOE Credential Office in order to be recommended for a preliminary credential.

Clear Credential

The second tier of teacher credentialing in California is the *clear* credential. California Senate Bill 2042 transferred the recommending of a clear teaching credential to school districts via Induction Programs. Graduates obtaining their preliminary credential from Cal Poly should consult the school district employing them for information about Induction Programs and obtaining a clear credential.

Supplementary and Subject Matter Authorizations

A basic teaching credential can be enhanced by adding supplementary and/or subject matter authorizations. These authorizations allow teachers to teach additional subjects without completing a full professional preparation program for that credential and we encourage candidates to consider whether it is possible to add these as part of completing their preliminary credential. To earn an authorization, students must complete a specific number of course credits in the new content area. See www.ctc.ca.gov (<http://www.ctc.ca.gov>) for specific information on these authorizations and consult with your credential advisor to plan your coursework in order to meet the necessary requirements for any additional authorizations desired.

Graduate Programs Credential Programs

Credential programs are accredited by the California Commission on Teacher Credentialing (CTC) to prepare candidates and recommend for these credentials.

Admission

Details concerning specific requirements are available from the appropriate advisor, the advisement handbook, or at <https://soe.calpoly.edu>.

Admission into programs leading to licensure and credentialing does not guarantee that students will obtain a license or credential. Licensure and credentialing requirements are set by agencies that are not controlled by or affiliated with the CSU and requirements can change at any time. For example, licensure or credentialing requirements can include evidence of the right to work in the United States (e.g., social security number or tax payer identification number) or successfully passing a criminal background check. Students are responsible for determining whether they can meet licensure or credentialing requirements. The CSU will not refund tuition, fees, or any associated costs, to students who determine subsequent to admission that they cannot meet licensure or credentialing requirements.

Administrative Services

- Preliminary
- Administrative Intern

The Educational Leadership and Administration Program offers the California Preliminary Administrative Services Credential for eligible candidates who hold a valid CLEAR California teaching or service credential and who have completed five (5) years of full-time teaching/

service with this credential. The Administrative Internship Program is an option for those who are requested by their employing district to concurrently serve in an administrative position while completing the requirements for the California Preliminary Administrative Services Credential.

California Preliminary Administrative Services

This program emphasizes a comprehensive knowledge of K-12 school administration including applied theory, administration and leadership, schools in contemporary society, and effective management related to educational outcomes. As a basis for credential recommendation, the preliminary program emphasizes applied theory with actual experience in fieldwork assignments and an evaluation of administrative competence.

The credential program requires 58 quarter units, all of which are applicable to the MA in Education with a Specialization in Leadership and Administration. The Preliminary Administrative Services Credential authorizes service in any administrative position at any grade level (K-12) in California.

Administrative Intern

This program supports districts that have an immediate need for an administrator and are without suitable candidates. Candidates earn the Preliminary Administrative Services Credential as they serve in an administrative capacity within a one year time frame.

Education Specialist (Mild/Moderate Disabilities)

- Preliminary

This credential authorizes the holder to teach in the following settings: special day classes, special schools, home/hospital settings, correctional facilities, nonpublic schools and agencies, and resource rooms.

The program is designed to prepare candidates to work with pupils with mild/moderate disabilities, which include specific learning disabilities; mild to moderate intellectual disabilities; attention deficit and attention deficit and hyperactivity disorders; and serious emotional disturbances, and authorizes serving individuals in K-12, and in classes organized for adults through age 22.

A full-time candidate may complete the requirements in one calendar year. The Education Specialist program is heavily field based and requires 62 quarter units, most of which are applicable to the MA in Education with a Specialization in Special Education.

A Multiple or Single Subject teaching credential is *not* required for admission. However, some coursework taken for the Single Subject or Multiple Subject Credential program may meet prerequisite course requirements for the Education Specialist Credential program.

Master of Arts in Education

Applications for Fall 2018 admission to the MA Education program are not currently being accepted. Please see below for information on new programs accepting Fall 2018 applications.

General Characteristics

The Master of Arts degree program in Education is designed to provide a broad-based perspective of education. Specializations within this

degree program, are closely related to the occupational and professional requirements of a variety of pursuits in the fields of education, college student affairs, and agencies involved with community affairs.

Admission

Admission to the MA in Education degree program minimally requires the following:

- 3.0 GPA in last 90 quarter units
- Letters of recommendation
- Bachelors degree from a regionally accredited college/university

Each specialization below may include additional requirements for the specific program (see the Graduate section (p. 408) of this catalog for additional information on admission).

Program of Study

All specializations require a minimum of 45 quarter units of graduate work, with at least 40 units of 500-level Education (EDUC) courses. Courses taken in these specializations may also be applied toward related credentials.

Candidates must earn a grade of C- or better in all courses, maintain an overall grade point average of 3.0 or better, and remain in good professional standing within their specialization. All candidates must meet the Graduation Writing Requirement.

Credits earned in student teaching are not accepted toward completion of any specialization within the MA Education. At least 36 program-required units shall be completed in residence. Transfer and/or extension credits are only accepted when the credits are acceptable for master's degree credit by the offering institution in its own programs. Transfer credits are not accepted for the MA in Education with a specialization in Educational Leadership and Administration.

Advising

The candidate must meet with his/her advisor on a regular basis. Continued consultation with the advisor assists a smooth progression toward completion of the degree.

Formal Study Plan

The candidate is required to file a Formal Study Plan prior to completion of 12 units in his/her program. This plan is completed in consultation with the program advisor and helps the candidate to schedule courses in a sequence that results in timely completion of the program. A Formal Study Plan is required prior to Advancement to Candidacy.

Advancement to Candidacy

Advancement to master's degree candidacy requires:

- Completing at least 24 units of program-required courses in residence, specified in a formal program of study, with minimum GPA of 3.0;
- Meeting the university Graduation Writing Requirement;
- Receiving formal recommendation of the graduate faculty;
- Earning a GPA of 3.0 in all coursework included on the formal program of study, and in all coursework completed subsequent to admission to post baccalaureate standing; and
- Meeting all conditions of admission.

Culminating Experience

Depending on the specialization, final assessment of a candidate's progress shall include a comprehensive written examination and EDUC 590 Research Application in Education, or the completion of a thesis/project. Students must enroll in EDUC 599 Thesis in Education for every quarter in which they are receiving related advisement.

MA Education, Specialization in Counseling & Guidance

This program prepares students for careers as student affairs professionals and counselors in higher education settings. Admission to the program, which occurs **only** in spring quarter, requires references, an auto-biographical statement, and an interview. Students who have career goals of working in clinical counseling in agency settings or in private practice should refer to the MS Psychology in the College of Liberal Arts (p. 257).

MA Education, Specialization in Curriculum and Instruction

A Master of Arts in Education with a specialization in Curriculum and Instruction offers the opportunity for PreK-16 educators to advance their knowledge and practice in working with ambitious curricula and complex instructional approaches to foster students' development of deep understanding and multiple literacies for the 21st century.

Candidates in the program will be required to have at least two years of teaching experience so that they have automated the skills necessary to lead instruction and can build more advanced knowledge and skills. Courses in the program are hybrid in nature to enable the working educator to manage full-time employment while completing coursework, and they are designed with readings and activities that are practical as well as providing more in-depth information about key concepts that inform us about teaching for understanding. Completion of the program will place candidates in a position to take on curriculum design and/or instructional leadership roles or to lead professional development opportunities in their programs, schools or districts. In addition, it will lay the groundwork for graduate study at the doctoral level.

In the program, candidates will be part of a cohort and have collaborative learning opportunities to deepen their understanding of effective teaching practice with the ambitious standards in K-16 education today, and the theories/principles underlying them as well as research-based evidence behind them. A culminating experience will be a project involving the design and conduct of research in a classroom in response to an authentic question about teaching practice. Teachers engage in elements of this type of activity on a daily basis as they try out ideas to support the learning of their students. In this program, such activity will be taken on in a more formal and systematic way, as either an action research project or a thesis project in education, with the result that each candidate will be contributing to our knowledge base about what works in classrooms to support desired student development.

MA Education, Specialization in Educational Leadership and Administration

The M.A. and Preliminary Administrative Services Credential program allows students to complete their master's degree and/or credential in 16 weekends (Friday evenings and all day Saturdays) and one summer session during an 11-month period. This rigorous, practical program is designed for those seeking leadership positions in K-12 schools, community colleges, universities, the military, government agencies, and educationally related organizations. Students are admitted once each year in the fall, and they progress through the program as a cohort. The program emphasizes applied theories of educational leadership, mastery of practical skills required for effective school administration and competence in research methods necessary for understanding and assessing learning organizations. While designed primarily for K-16 leaders, the program is beneficial for leaders from other fields. Individuals interested in leading nonprofit organizations are encouraged to apply.

MA Education, Specialization in Special Education

Applicants who enroll in this specialization must meet personal and professional standards, including necessary qualifying examinations, presentation of personal recommendations, and a personal interview. Approved units for the master's degree program can be applied towards the requirements for a Preliminary Education Specialist Credential. It is also possible for qualified students to complete the requirements for the Specialist Credential while pursuing the requirements for the Master of Arts degree in Education.

MA Curriculum and Instruction

New program, effective Fall 2018

General Characteristics

A Master of Arts in Curriculum and Instruction offers the opportunity for PreK-16 teachers to advance their knowledge and practice in working with ambitious curricula and complex instructional approaches to foster students' deep understanding and development of multiple literacies for the 21st century. Applicants are required to have at least two years of classroom teaching experience so that they have developed the skills necessary to run a classroom and can build more advanced knowledge and skills upon that foundation.

Admission

- Admissions for the MA Curriculum & Instruction degree minimally requires the following:
- 2 years of PreK-16 classroom teaching experience
- 3.0 GPA in last 90 quarter units
- 3 Letters of recommendation
- Bachelor's degree from a regionally accredited college/university
- An interview with program faculty

Program of Study

The program will support students in developing the requisite knowledge and experience to take on curriculum design, instructional leadership, or lead professional development opportunities in their schools or districts. In addition, it will provide foundational experiences that will facilitate graduate work at the doctoral level. Students will be part of a cohort and

have collaborative learning opportunities to foster understanding of the theories and principles underlying research-based advanced practices.

Advising

Students must meet with their advisor on a regular basis to ensure a smooth progression toward completion of the degree.

Formal Study Plan

The candidate is required to file a Formal Study Plan prior to completion of 12 units in the program. This plan is completed in consultation with the program advisor and helps the candidate to schedule courses in a sequence that results in timely completion of the program. A Formal Study Plan is required prior to Advancement to Candidacy.

Advancement to Candidacy

- Advancement to master's degree candidacy requires:
- Completing at least 24 units of program-required courses in residence
- Meeting the university Graduation Writing Requirement
- Receiving formal recommendation of the graduate faculty
- Earning a GPA of 3.0 in all coursework included on the formal program of study, and in all coursework completed subsequent to admission to post baccalaureate standing; and
- Meeting all conditions of admission.

Culminating Experience

The culminating experience is an Action Research Project conducted in a learning environment. Students must receive a minimum score of 80 percent to pass the project. If a student fails to receive a passing mark, s/he will be permitted to rewrite and/or revise the project one additional time.

MA Educational Leadership and Administration

New program, effective Fall 2018

General Characteristics

The Master of Arts in Educational Leadership and Administration Program (ELAP) allows students to complete their Master's degree in 16 weekends (Friday evenings and all day Saturdays) and one summer session during an 11-month period. It is possible for qualified students to also complete the requirements for the Preliminary Administrative Services Credential.

Admission

- Admission to ELAP minimally requires the following:
- 3.0 GPA in last 90 quarter units
- 3 Letters of recommendation
- Bachelor's degree from a regionally accredited college/university
- Autobiographical statement
- An in-person interview or video testimonial

Program of Study

The MA in Educational Leadership and Administration is a rigorous, practical program designed for those seeking leadership positions in K-12 schools, school districts, and educationally related organizations. Students are admitted once each year in the fall, and they progress through the program as a cohort. The program emphasizes applied theories of educational leadership, mastery of practical skills required

for effective school administration and competence in research methods necessary for understanding and assessing learning organizations.

Advising

The candidate must meet with his/her advisor on a regular basis. Continued consultation with the advisor assists a smooth progression toward completion of the degree.

Formal Study Plan

The candidate is required to file a Formal Study Plan prior to completion of 12 units in his/her program. This plan is completed in consultation with the program advisor and helps the candidate to schedule courses in a sequence that results in timely completion of the program. A Formal Study Plan is required prior to Advancement to Candidacy.

Advancement to Candidacy

- Advancement to master's degree candidacy requires:
- Completing at least 24 units of program-required courses in residence
- Meeting the university Graduation Writing Requirement
- Receiving formal recommendation of the graduate faculty
- Earning a GPA of 3.0 in all coursework included on the formal program of study, and in all coursework completed subsequent to admission to post baccalaureate standing; and
- Meeting all conditions of admission.

Culminating Experience

The culminating experience is a Comprehensive Examination consisting of questions drawn from material presented in each ELAP course (fieldwork is excluded). Students must receive a minimum score of 80 percent to pass the exam. If a candidate fails to receive a passing mark, s/he will be permitted to retake the Exit Examination one additional time. Students will have three hours to complete the exam.

MS Higher Education Counseling and Student Affairs

New program, effective Fall 2018

General Characteristics

The Master of Science in Higher Education and Counseling and Student Affairs (HECSA) program prepares students for careers as student affairs professionals and counselors in higher education settings. Admission to the program, which occurs only in spring quarter, requires references, an auto-biographical statement, and an interview. Students who have career goals of working in clinical counseling in agency settings or in private practice should refer to the MS Psychology in the College of Liberal Arts.

Admission

Admission to the MS in Higher Education Counseling and Student Affairs degree minimally requires the following:

- 3.0 GPA in last 90 quarter units
- 3 Letters of recommendation
- Bachelor's degree from a regionally accredited college/university
- Auto-biographical statement
- An interview with program faculty

Program of Study

Students attending full-time complete the 72-unit program in two years; students attending the program part-time typically complete the program in three years. A major strength of the program is its extensive internship experience, which takes place during the second year of study and provides students with “real world” work experience. Applicants may come from a wide variety of educational and professional backgrounds; no specific undergraduate degree is required. Although many students have backgrounds in Psychology and Social Sciences, others have possessed backgrounds in Agriculture, Business, Mathematics and the natural sciences.

Advising

The candidate must meet with his/her advisor on a regular basis. Continued consultation with the advisor assists a smooth progression toward completion of the degree.

Formal Study Plan

The candidate is required to file a Formal Study Plan prior to completion of 12 units in the program. This plan is completed in consultation with the program advisor and helps the candidate to schedule courses in a sequence that results in timely completion of the program. A Formal Study Plan is required prior to Advancement to Candidacy.

Advancement to Candidacy

Advancement to master's degree candidacy requires:

- Completing at least 24 units of program-required courses in residence
- Meeting the university Graduation Writing Requirement
- Receiving formal recommendation of the graduate faculty
- Earning a GPA of 3.0 in all coursework included on the formal program of study, and in all coursework completed subsequent to admission to post baccalaureate standing; and
- Meeting all conditions of admission.

Culminating Experience

The culminating experience is a four hour Comprehensive Examination consisting of three essay questions drawn from material presented in each of the HECSA courses. The exam is scored anonymously utilizing a rubric developed by HECSA faculty. Students must pass all three sections to pass the exam. If a candidate fails a single section, they may retake just that segment. If a candidate fails multiple sections, they may retake the entire exam one additional time.

MS Special Education

New program, effective Fall 2018

General Characteristics

The Master of Science in Special Education is designed to develop the knowledge and skills that will contribute to your success as a special day class teacher, resource specialist, inclusion specialist, autism specialist, or clinician. Approved units for the master's degree program directly apply towards the requirements for a Preliminary Level I Education Specialist Credential (Special Education) Mild/Moderate Disabilities. It is possible for qualified students to complete the requirements for the Specialist Credential while pursuing the requirements for the Master's degree.

Admission

Admission to the MS in Special Education degree minimally requires the following:

- 3.0 GPA in last 90 quarter units
- 3 Letters of recommendation
- Bachelor's degree from a regionally accredited college/university
- Auto-biographical statement
- An interview with program faculty

Program of Study

The MS in Special Education (SPED) is a 45-unit, cohort-based program beginning each fall quarter. Cohorts are limited each year to 20 students. The MS in Special Education can be earned in three quarters of full-time enrollment, although there is an option to complete the program in two years. The MS SPED allows students to acquire depth in a “disability area,” and understand how action research can improve and enhance a teacher's classroom performance.

Advising

The candidate must meet with his/her advisor on a regular basis. Continued consultation with the advisor assists a smooth progression toward completion of the degree.

Formal Study Plan

The candidate is required to file a Formal Study Plan prior to completion of 12 units in his/her program. This plan is completed in consultation with the program advisor and helps the candidate to schedule courses in a sequence that results in timely completion of the program. A Formal Study Plan is required prior to Advancement to Candidacy.

Advancement to Candidacy

Advancement to master's degree candidacy requires:

- Completing at least 24 units of program-required courses in residence
- Meeting the university Graduation Writing Requirement
- Receiving formal recommendation of the graduate faculty
- Earning a GPA of 3.0 in all coursework included on the formal program of study, and in all coursework completed subsequent to admission to post baccalaureate standing; and
- Meeting all conditions of admission.

Culminating Experience

The culminating experience is a project consisting of a year-long applied research study in a school placement and submission of a final research paper. Drawing from coursework content on applied behavior analysis and research and evidence-based practices in special education, students design, propose, implement, evaluate, and disseminate a research study intended to address a targeted area of need for a school-aged individual with a mild or moderate disability. Students are evaluated on a final research paper that they submit by the 8th week of the quarter in the spring.

MA Education, Specialization in Counseling and Guidance

Required Education Courses

EDUC 586	Introduction to Inquiry in Education
----------	--------------------------------------

EDUC 587	Educational Foundations and Current Issues	4
EDUC 588	Education, Culture, and Learning	4
EDUC 589	Educational Research Methods	4
Select from the following:		4-6
EDUC 590	Research Application in Education (and comprehensive exam)	
EDUC 599	Thesis in Education (3, 3)	
Required in the Area of Specialization		
EDUC 555	Introduction to the Counseling Profession	4
EDUC 556	Multicultural Counseling	4
EDUC 557	Career Counseling	4
EDUC 560	Counseling Theories	4
EDUC 561	Group Counseling	4
EDUC 562	Student Development - Higher Education	4
EDUC 564	Legal and Ethical Issues in Counseling	4
EDUC 565	Counseling Measurement and Assessment	4
EDUC 566	Leadership and Consultation in Counseling	4
EDUC 568	Individual Counseling Techniques	4
EDUC 573	Field Experience, Counseling	12
Total units		72-74

MA Education, Specialization in Curriculum and Instruction

Required Education Courses

EDUC 586	Introduction to Inquiry in Education	4
EDUC 587	Educational Foundations and Current Issues	4
EDUC 588	Education, Culture, and Learning	4
EDUC 589	Educational Research Methods	4

Required in the Area of Specialization

EDUC 502	Advancing Pedagogical Practices with Technology	4
or EDUC 523	Integrative Approaches to Curriculum	
EDUC 521	Literacy Across the Curriculum	4
EDUC 522	Advanced Classroom Pedagogy	4
EDUC 532	Advanced Field Experiences in Education	2

Culminating Experience in the Area of Specialization

Select from the following:		3
EDUC 598	Action Research Project in Education	
EDUC 599	Thesis in Education	

Areas of Emphasis

Select one of the following:		12
------------------------------	--	----

Elementary Teacher Education

EDUC 528	Advanced Classroom Pedagogy in English Language Arts	
----------	--	--

EDUC 535	Advanced Classroom Pedagogy in Elementary Mathematics Education	
EDUC 536	Advanced Classroom Pedagogy in Elementary Science Education	
Secondary Teacher Education		
Courses chosen in consultation with advisor (from a program-generated list of acceptable courses in specific disciplines)		
Total units		45

MA Education, Specialization in Educational Leadership and Administration

Fall Quarter - Organizational Leadership

EDUC 586	Introduction to Inquiry in Education	4
EDUC 512	Education Organization and Management	4
EDUC 513	Education Planning and Decision Making	4
EDUC 518	Administrative Services Fieldwork ¹	3

Winter Quarter - Instructional Leadership

EDUC 515	Educational Program Management and Evaluation	4
EDUC 516	Educational Personnel Supervision and Evaluation	4
EDUC 589	Educational Research Methods	4
EDUC 518	Administrative Services Fieldwork ¹	3

Spring Quarter - Managerial Leadership

EDUC 510	Education Finance and Resource Allocation	4
EDUC 511	Educational Law and Governance	4
EDUC 519	Professional e-Portfolios for Educational Leaders	1
EDUC 542	Administration of Special Programs and Services	4
EDUC 518	Administrative Services Fieldwork ¹	3

Summer Session - Community Leadership

EDUC 587	Educational Foundations and Current Issues	4
EDUC 588	Education, Culture, and Learning	4
EDUC 590	Research Application in Education ²	4

Total units ³ 49/58

¹ Administrative services credential candidates only.

² All students are required to complete a comprehensive electronic portfolio and pass an exit examination at the end of the program.

³ M.A. degree requires 49 units minimum. M.A. degree plus credential requires 58 units minimum.

MA Education, Specialization in Special Education

Required Courses

EDUC 586	Introduction to Inquiry in Education	4
EDUC 587	Educational Foundations and Current Issues	4
EDUC 588	Education, Culture, and Learning	4
EDUC 589	Educational Research Methods	4
EDUC 590	Research Application in Education	4

Required in Area of Specialization

EDUC 545	Characteristics and Instruction of Pupils with Mild/Moderate Disabilities	5
EDUC 546	Reading and Language Arts Instruction in Special Education	5
EDUC 550	Assessment Strategies for Special Education	5

Electives

Selected with advisor's approval	10
Total units	45

MA Curriculum and Instruction

EDUC 502	Advancing Pedagogical Practices with Technology	4
EDUC 521	Literacy Across the Curriculum	4
EDUC 522	Advanced Classroom Pedagogy	4
EDUC 523	Integrative Approaches to Curriculum	4
EDUC 532	Advanced Field Experiences in Education	2
EDUC 586	Introduction to Inquiry in Education	4
EDUC 587	Educational Foundations and Current Issues	4
EDUC 588	Education, Culture, and Learning	4
EDUC 589	Educational Research Methods	4
EDUC 598	Action Research Project in Education	3
Select one of the following Emphasis areas below:		8

Elementary Teaching Emphasis

EDUC 528	Advanced Classroom Pedagogy in English Language Arts	
EDUC 535	Advanced Classroom Pedagogy in Elementary Mathematics Education	

Secondary Teaching Emphasis

EDUC 405	Social, Historical and Cultural Influences on Latino/a Students in Education	
EDUC 414	Curriculum and Inquiry in Public Schools	
EDUC 416	Literacy, Language, and Culture in Content Area Classrooms	
EDUC 440	Educating Individuals with Exceptional Needs	
EDUC 528	Advanced Classroom Pedagogy in English Language Arts	
EDUC 535	Advanced Classroom Pedagogy in Elementary Mathematics Education	

Total units	45
-------------	----

MA Educational Leadership and Administration

EDUC 510	Education Finance and Resource Allocation	4
EDUC 511	Educational Law and Governance	4
EDUC 512	Education Organization and Management	4
EDUC 513	Education Planning and Decision Making	4
EDUC 515	Educational Program Management and Evaluation	4
EDUC 516	Educational Personnel Supervision and Evaluation	4
EDUC 519	Professional e-Portfolios for Educational Leaders	1
EDUC 542	Administration of Special Programs and Services	4
EDUC 586	Introduction to Inquiry in Education	4
EDUC 587	Educational Foundations and Current Issues	4
EDUC 588	Education, Culture, and Learning	4
EDUC 589	Educational Research Methods	4
EDUC 590	Research Application in Education	4
Total units		49

MS Higher Education Counseling and Student Affairs

EDUC 555	Introduction to the Counseling Profession	4
EDUC 556	Multicultural Counseling	4
EDUC 557	Career Counseling	4
EDUC 560	Counseling Theories	4
EDUC 561	Group Counseling	4
EDUC 562	Student Development - Higher Education	4
EDUC 564	Legal and Ethical Issues in Counseling	4
EDUC 565	Counseling Measurement and Assessment	4
EDUC 566	Leadership and Consultation in Counseling	4
EDUC 568	Individual Counseling Techniques	4
EDUC 573	Field Experience, Counseling	12
EDUC 586	Introduction to Inquiry in Education	4
EDUC 587	Educational Foundations and Current Issues	4
EDUC 588	Education, Culture, and Learning	4
EDUC 589	Educational Research Methods	4
EDUC 590	Research Application in Education	4
Total units		72

MS Special Education

EDUC 545	Characteristics and Instruction of Pupils with Mild/Moderate Disabilities	5
EDUC 546	Reading and Language Arts Instruction in Special Education	5
EDUC 550	Assessment Strategies for Special Education	5
EDUC 552	Support and Transition Strategies in Special Education	5
EDUC 554	Behavior Disorders and Positive Behavior Support Strategies	5
EDUC 586	Introduction to Inquiry in Education	4
EDUC 587	Educational Foundations and Current Issues	4
EDUC 588	Education, Culture, and Learning	4
EDUC 589	Educational Research Methods	4
EDUC 590	Research Application in Education	4
Total units		45

Statistics

Faculty Offices East (25), Room 107D

Phone: 805.756.2709

<https://statistics.calpoly.edu>

Department Chair: Allan J. Rossman

ACADEMIC PROGRAMS

Program name	Program type
Cross Disciplinary Studies Minor in Data Science	Minor
Statistics	BS, Minor

The Statistics Department offers a variety of introductory courses to students majoring in diverse disciplines across the University, in addition to providing a vibrant undergraduate degree program in Statistics for students who want to pursue careers in industry or graduate study in the discipline. The department also offers a minor in Statistics and contributes to a minor program in Actuarial Preparation and a cross-disciplinary studies minor program in Data Science.

Data abound in everyday life, in most academic disciplines, and in many industries. Professionals in many fields need to design studies, collect data, analyze results, and draw sound conclusions. In addition, professional statisticians must apply mathematical underpinnings of the discipline to new problems, use computing skills to organize and manipulate data, and communicate effectively with clients as well as with peers.

Employment prospects for professionals with skills in statistics and data science are very bright. Recent graduates of Cal Poly's program in statistics are working for companies in fields as varied as banking, social media, retail, entertainment, insurance, education, and pharmaceutical development.

Undergraduate Programs

BS Statistics

The statistics degree program requires students to develop a strong foundation in mathematics and computer science, as well as experience with a field of application. Coursework in the statistics program can be classified into four areas. Some courses provide mathematical background in probability and theoretical statistics. Others focus on computational thinking and coding skills with software packages. Most courses teach particular statistical methods for various types of data analysis such as regression, experimental design, categorical data analysis, time series techniques, multivariate methods, and survival analysis. Finally, some course specifically develop students' skills with oral and written communication and consulting with clients. Throughout the program students encounter the entire process of conducting statistical investigations, from asking questions and designing studies through drawing conclusions and communicating results, throughout their studies. Statistics students repeatedly analyze real data from genuine studies and also acquire extensive experience using statistical software and writing technical reports of their analyses and findings.

Actuarial Preparation Minor

For information regarding the Actuarial Preparation Minor, please see College of Science and Mathematics (p. 336) section.

Cross Disciplinary Studies Minor in Data Science

Through an inter-college collaboration, the Computer Science and Statistics departments offer a cross-disciplinary minor in Data Science – a rapidly evolving discipline that uses elements of statistics and computer science to gather, organize, summarize, and communicate information from a variety of data sources and data types. Job opportunities for data scientists are growing as the availability of data becomes ever abundant via the internet, consumer transactions, sensor arrays, medical records, embedded biometrics, bionformatics, etc.

The CDSM provides an opportunity for both statistics and computer science students to complement their major training with foundational skills for data science. Statistics majors will acquire essential programming, database, distributed computing, and data mining skills from the Computer Science Department while computer science majors will acquire essential probability, regression modelling, statistical programming, and multivariate analysis skills from the Statistics Department.

Statistics Minor

The Statistics minor program allows students from across the University to acquire substantial statistical skills that can be applied in their own disciplines.

BS Statistics

Program Learning Objectives

1. Have good working knowledge of the most commonly used statistical methods, including statistical modeling and omnipresent role of variability, efficient design of studies and construction of effective sampling plans, exploratory data analysis, and formal inference process.
2. Have background in probability, statistical theory, and mathematics, including especially calculus, linear algebra and symbolic and abstract thinking.
3. Be able to synthesize and apply knowledge of common inferential methods, understanding the limitations of procedures and appropriate conclusions.
4. Communicate effectively (written and oral) with skills in collaboration (within and between disciplines) and teamwork, and in organizing and managing projects.
5. Have a good mastery of several standard statistical software packages and facility with data management strategies.
6. Have a focused concentration in an area of application outside the discipline of statistics.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 32) section of this catalog, including:

- 60 units of upper division courses

- Graduation Writing Requirement (GWR)
- 2.0 GPA
- U.S. Cultural Pluralism (USCP)

Note: No course with a STAT prefix may be selected as credit/no credit.

MAJOR COURSES

STAT 150	Introduction to the Discipline of Statistics	2
MATH 141	Calculus I (B1) ¹	4
MATH 142	Calculus II (B1) ¹	4
MATH 143	Calculus III	4
MATH 206	Linear Algebra I	4
MATH 241	Calculus IV	4
STAT 301	Statistics I	4
STAT 302	Statistics II	4
STAT 305	Introduction to Probability and Simulation	4
STAT 323	Design and Analysis of Experiments I	4
STAT 330	Statistical Computing with SAS	4
STAT 331	Statistical Computing with R	4
STAT 334	Applied Linear Models	4
STAT 365	Statistical Communication	2
STAT 425	Probability Theory	4
STAT 426	Estimation and Sampling Theory	4
STAT 427	Mathematical Statistics	4
STAT 461	Senior Project I	1
STAT 462	Senior Project II	2
STAT 465	Statistical Consulting	4

Statistics Electives:

Select from List A below: 12

STAT 405	Applied Probability Models
STAT 414	Multilevel and Mixed Modeling
STAT 415	Bayesian Reasoning and Methods
STAT 416	Statistical Analysis of Time Series
STAT 417	Survival Analysis Methods
STAT 418	Categorical Data Analysis
STAT 419	Applied Multivariate Statistics
STAT 421	Survey Sampling and Methodology
STAT 423	Design and Analysis of Experiments II
STAT 434	Statistical Learning: Methods and Applications

Select from List B below: 12

Any 400-level STAT course (including those in List A)	
CSC/CPE 202	Data Structures
CSC/CPE 203	Project-Based Object-Oriented Programming and Design
CSC 236	Fundamentals of Computer Science for Scientists and Engineers II
CSC 348	Discrete Structures
CSC 349	Design and Analysis of Algorithms
CSC 365	Introduction to Database Systems
CSC 369	Introduction to Distributed Computing

DATA 301	Introduction to Data Science
IME 430	Quality Engineering
ITP 303	Lean Six Sigma Green Belt
MATH 242	Differential Equations I
MATH 306	Linear Algebra II
MATH 335	Graph Theory
MATH 336	Combinatorial Math
MATH 406	Linear Algebra III
MATH 412	Introduction to Analysis I
MATH 413	Introduction to Analysis II
MATH 414	Introduction to Analysis III
MATH 437	Game Theory
MATH 451	Numerical Analysis I

SUPPORT COURSES

Select from the following: 4

CSC/CPE 101	Fundamentals of Computer Science
CSC 235	Fundamentals of Computer Science for Scientists and Engineers I

MATH 248	Methods of Proof in Mathematics	4
----------	---------------------------------	---

Approved support electives ² 8

GENERAL EDUCATION (GE)

(See GE program requirements below.) 64

FREE ELECTIVES

Free Electives 5

Total units 180

¹ Required in Major; also satisfies GE.

² Consultation with faculty advisor is required of students, to select and obtain approval for these courses. Students are requested to consult their advisors before the start of their junior year.

General Education (GE) Requirements

- 72 units required, 8 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing	4
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Major) ¹	0
B2	Life Science	4
B3	Physical Science	4
B4	One lab taken with either a B2 or B3 course	
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts	4
C4	Upper-division elective	4
Area C elective	(Choose one course from C1-C5)	4

Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		64

¹ Required in Major.

Cross Disciplinary Studies Minor in Data Science

CSC/CPE 101	Fundamentals of Computer Science	4
CSC/CPE 202	Data Structures	4
CSC/CPE 203	Project-Based Object-Oriented Programming and Design	4
CSC 348	Discrete Structures	4
or MATH 248	Methods of Proof in Mathematics	
CSC 349	Design and Analysis of Algorithms	4
CSC 365	Introduction to Database Systems	4
CSC 369	Introduction to Distributed Computing	4
CSC 466	Knowledge Discovery from Data	4
DATA 301	Introduction to Data Science	4
DATA 401	Data Science	4
DATA 451	Data Science Capstone I	2
DATA 452	Data Science Capstone II	2
MATH 143	Calculus III	4
MATH 206	Linear Algebra I	4
or MATH 244	Linear Analysis I	
STAT 302	Statistics II	4
or STAT 312	Statistical Methods for Engineers	
STAT 305	Introduction to Probability and Simulation	4
STAT 334	Applied Linear Models	4
STAT 331	Statistical Computing with R	4
STAT 419	Applied Multivariate Statistics	4
Technical Electives (CSC/STAT/DATA/MATH/PHYS)		8
Total units		80

Statistics Minor

Select one of the following introductory sequences: 8-9

STAT 217 & STAT 313	Introduction to Statistical Concepts and Methods and Applied Experimental Design and Regression Models
---------------------	--

STAT 218 & STAT 313	Applied Statistics for the Life Sciences and Applied Experimental Design and Regression Models
STAT 251 & STAT 252	Statistical Inference for Management I and Statistical Inference for Management II
STAT 301 & STAT 302	Statistics I and Statistics II
STAT 312 & STAT 313	Statistical Methods for Engineers and Applied Experimental Design and Regression Models
STAT 321 & IME 326	Probability and Statistics for Engineers and Scientists and Engineering Test Design and Analysis
Select from the following: 16	
STAT 305	Introduction to Probability and Simulation ¹
STAT 323	Design and Analysis of Experiments I
STAT 324	Applied Regression Analysis
STAT 330	Statistical Computing with SAS
STAT 331	Statistical Computing with R
STAT 334	Applied Linear Models
STAT 405	Applied Probability Models
STAT 410	Statistics Education: Pedagogy, Content, Technology, and Assessment
STAT 414	Multilevel and Mixed Modeling
STAT 415	Bayesian Reasoning and Methods
STAT 416	Statistical Analysis of Time Series
STAT 417	Survival Analysis Methods
STAT 418	Categorical Data Analysis
STAT 419	Applied Multivariate Statistics
STAT 421	Survey Sampling and Methodology
STAT 423	Design and Analysis of Experiments II
STAT 425	Probability Theory ¹
STAT 426	Estimation and Sampling Theory
STAT 427	Mathematical Statistics
STAT 434	Statistical Learning: Methods and Applications
Total units 24-25	

¹ Students may only count one of the following: STAT 305 or STAT 325 or STAT 425 for credit in the minor.

Interdisciplinary Degree Programs

A degree that is jointly offered by different colleges is known as an interdisciplinary program. Cal Poly offers the following interdisciplinary degree programs.

1. BA Liberal Arts and Engineering Studies
2. MS Engineering Management
3. MCRP/MS Engineering with a specialization in Transportation Planning

Liberal Arts and Engineering Studies

<https://laes.calpoly.edu>

laes@calpoly.edu

Program Co-Director: David D. Gillette

Phone: 805.756.2331

ddgillet@calpoly.edu

Program Co-Director: Michael L. Haungs

Phone: 805.756.5531

mhaungs@calpoly.edu

Academic Programs

Effective Spring 2019, the degree designation for the Liberal Arts and Engineering Studies program is changed from B.A. to B.S.

Program name	Program type
Liberal Arts & Engineering Studies	BA (ending Winter 2019)
Liberal Arts & Engineering Studies	BS (starting Spring 2019)

The Liberal Arts and Engineering Studies (LAES) degree is jointly offered by the colleges of Liberal Arts and Engineering. This program prepares students for a wide range of innovative careers in emerging professional fields that combine skills and interests in the arts, technology and culture, and also prepares them for further study in graduate school. This program, which only accepts students as internal transfers after the first year, is open to all students at Cal Poly. This program is not intended to be an ABET-accredited engineering program.

Undergraduate Programs

Liberal Arts and Engineering Studies

Effective Spring 2019, the degree designation for the Liberal Arts and Engineering Studies program is changed from B.A. to B.S.

Students in the Liberal Arts and Engineering Studies program, in collaboration with students from all other Cal Poly majors, have the opportunity to participate in development teams working on national and international technology and cultural projects. To further prepare students for work with diverse teams that include participants from across the globe, the program strongly encourages students to spend three to six months studying and/or working abroad.

The Liberal Arts and Engineering Studies degree can lead to careers in fields such as:

- Animatronics
- Audio Engineering
- Digital Media Production and Management
- Digital Publishing
- Environmental Technology Education
- Film and Television Production
- Game Design
- Government Policy Making / Analysis
- International Technology Management
- STEM Education in School and Out-of-School Contexts
- Sustainable Community Development
- Technical Communications
- Technology Services and Management
- Web Design

BS Liberal Arts and Engineering Studies -

BA Liberal Arts and Engineering Studies

Program Learning Objectives

Graduates of the Liberal Arts and Engineering Studies program receive a solid foundation in engineering and scientific principles, as well as a cultural appreciation that supports them in careers requiring significant levels of technical and cultural fluency. To support these goals, the primary learning objectives are to:

1. Think critically and creatively in the process of solving techno-social problems considering philosophical, aesthetic and expressive concerns.
2. Communicate effectively through a variety of media in diverse, multicultural perspectives and facilitate communication between technical and non-technical collaborators.
3. Use mathematics, science, and engineering principles to produce solutions to problems within the student's Liberal Arts and Engineering concentrations.
4. Function effectively as a member of interdisciplinary or international teams, formulating sustainable solutions to problems at the intersection of technology and society.
5. Demonstrate ethical and professional responsibilities associated with the creation, use and integration of technology.
6. Serve as informed and responsible citizens in a global culture and remain involved with learning and helping society improve.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 30) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

CHEM 124	General Chemistry for Physical Science and Engineering I (B3/B4) ¹	4
ENGL 149	Technical Writing for Engineers (A3) ¹	4
LAES 301	Project-Based Learning in Liberal Arts and Engineering Studies	4
LAES 302	Advanced Project-Based Learning in Liberal Arts and Engineering Studies	4
LAES 461	Senior Project in Liberal Arts and Engineering Studies	4
LAES 462	Capstone Senior Seminar in Liberal Arts and Engineering Studies	4
MATH 141	Calculus I (B1) ¹	4
MATH 142	Calculus II (B1) ¹	4
MATH 143	Calculus III (B5) ¹	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
PHYS 141	General Physics IA	4
PHYS 132	General Physics II	4
PHYS 133	General Physics III	4
STAT 312	Statistical Methods for Engineers	4
or STAT 321	Probability and Statistics for Engineers and Scientists	
or STAT 350	Probability and Random Processes for Engineers	

Study Abroad or Global Perspectives courses

300-400 level	8
---------------	---

Engineering Concentration or Individualized Course of Study

Minimum 12 units at 300-400 level ²	34-35
--	-------

Liberal Arts Concentration or Individualized Course of Study

Minimum 12 units at 300-400 level ²	24
--	----

GENERAL EDUCATION (GE)

(See GE program requirements below.)	40-52
--------------------------------------	-------

FREE ELECTIVES ^{2,3}

Free Electives	1-14
----------------	------

Total units	180
-------------	-----

¹ Required in Major; also satisfies GE

² Students must complete 60 upper-division units and a total of 180 units overall. Additional units may be required.

³ If GE courses are used to satisfy Support or Concentration requirements, additional units may be required to complete the 180 total unit requirement or 60 units of upper division.

Concentrations

LAES students must select *one* concentration from Engineering and *one* from Liberal Arts. Students may choose to follow an individualized course of study in Engineering or the the Liberal Arts constructed in consultation with LAES advisors.

Engineering (select one)

- Computer Graphics (p. 401)
- Electrical Engineering (Power) (p. 401)
- Industrial/Manufacturing Engineering - System Design (p. 401)
- Usability Studies (p. 402)

Individualized Course of Study in Engineering

Consists of 34 units of an advisor-approved integrated course of study from courses offered in the College of Engineering designed to meet the LAES learning objectives, with at least 12 of the units at the upper division level. Courses must be drawn from at least two engineering disciplines.

Liberal Arts (select one)

- Interactive Communication - Cinematic Focus (p. 402)
- Interactive Communication - Theatrical Focus (p. 402)
- Publishing Technology (p. 402)
- Technical Communication (p. 402)

Individualized Course of Study in the Liberal Arts

Consists of 24 units of an advisor-approved integrated course of study from courses offered in the College of Liberal Arts designed to meet the LAES learning objectives, with at least half of the units at the upper division level.

Students may complete a minor program selected from pre-approved minors. These minors include any minor offered by the College of Liberal Arts, as well as interdisciplinary, cross-college minors in which students complete a minimum of half of the units in the College of Liberal Arts (e.g., Indigenous Studies in Natural Resources & the Environment; Sustainable Environments).

General Education (GE) Requirements

- 72 units required, 20-32 of which are specified in Major, depending on concentration.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300-400 level.

Area A Communication

A1 Expository Writing	4
A2 Oral Communication	4
A3 Reasoning, Argumentation, and Writing (4 units in Major) ¹	0

Area B Science and Mathematics

B1 Mathematics/Statistics (8 units in Major) ¹	0
B2 Life Science	4
B3 Physical Science (4 units in Major) ¹	0
B4 One lab taken with either a B2 or B3 course	
B5 (4 units in Major) ¹	0

Area C Arts and Humanities

C1 Literature	4
C2 Philosophy	4
C3 Fine/Performing Arts (may be in concentration)	0-4
C4 Upper-division elective (may be in concentration)	0-4

Area D/E Society and the Individual

D1 The American Experience (Title 5, Section 40404 requirement)	4
D2 Political Economy	4
D3 Comparative Social Institutions	4
D4 Self Development (CSU Area E)	4
D5 Upper-division elective	4

Area F Technology Elective

F Upper-division elective (may be in concentration)	0-4
Total units	40-52

¹ Required in Major; also satisfies GE

BS Liberal Arts and Engineering Studies

Program Learning Objectives

Graduates of the Liberal Arts and Engineering Studies program receive a solid foundation in engineering and scientific principles, as well as a cultural appreciation that supports them in careers requiring significant levels of technical and cultural fluency. To support these goals, the primary learning objectives are to:

1. Think critically and creatively in the process of solving techno-social problems considering philosophical, aesthetic and expressive concerns.
2. Communicate effectively through a variety of media in diverse, multicultural perspectives and facilitate communication between technical and non-technical collaborators.
3. Use mathematics, science, and engineering principles to produce solutions to problems within the student's Liberal Arts and Engineering concentrations.
4. Function effectively as a member of interdisciplinary or international teams, formulating sustainable solutions to problems at the intersection of technology and society.
5. Demonstrate ethical and professional responsibilities associated with the creation, use and integration of technology.
6. Serve as informed and responsible citizens in a global culture and remain involved with learning and helping society improve.

Degree Requirements and Curriculum

In addition to the program requirements listed on this page, students must also satisfy requirements outlined in more detail in the Minimum Requirements for Graduation (p. 30) section of this catalog, including:

- 60 units of upper division courses
- 2.0 GPA
- Graduation Writing Requirement (GWR)
- U.S. Cultural Pluralism (USCP)

Note: No major, support or concentration courses may be selected as credit/no credit.

MAJOR COURSES

CHEM 124	General Chemistry for Physical Science and Engineering I (B3/B4) ¹	4
ENGL 149	Technical Writing for Engineers (A3) ¹	4
LAES 301	Project-Based Learning in Liberal Arts and Engineering Studies	4
LAES 302	Advanced Project-Based Learning in Liberal Arts and Engineering Studies	4
LAES 461	Senior Project in Liberal Arts and Engineering Studies	4
LAES 462	Capstone Senior Seminar in Liberal Arts and Engineering Studies	4
MATH 141	Calculus I (B1) ¹	4

MATH 142	Calculus II (B1) ¹	4
MATH 143	Calculus III (B5) ¹	4
MATH 241	Calculus IV	4
MATH 244	Linear Analysis I	4
PHYS 141	General Physics IA	4
PHYS 132	General Physics II	4
PHYS 133	General Physics III	4
STAT 312	Statistical Methods for Engineers	4
or STAT 321	Probability and Statistics for Engineers and Scientists	
or STAT 350	Probability and Random Processes for Engineers	

Study Abroad or Global Perspectives courses

300-400 level	8
---------------	---

Engineering Concentration or Individualized Course of Study

Minimum 12 units at 300-400 level ²	34-35
--	-------

Liberal Arts Concentration or Individualized Course of Study

Minimum 12 units at 300-400 level ²	24
--	----

GENERAL EDUCATION (GE)

(See GE program requirements below.)	52
--------------------------------------	----

FREE ELECTIVES ^{2,3}

Free Electives	1-14
Total units	180

¹ Required in Major; also satisfies GE

² Students must complete 60 upper-division units and a total of 180 units overall. Additional units may be required.

³ If GE courses are used to satisfy Support or Concentration requirements, additional units may be required to complete the 180 total unit requirement or 60 units of upper division.

Concentrations

LAES students must select *one* concentration from Engineering and *one* from Liberal Arts. Students may choose to follow an individualized course of study in Engineering or the the Liberal Arts constructed in consultation with LAES advisors.

Engineering (select one)

- Computer Graphics (p. 401)
- Electrical Engineering (Power) (p. 401)
- Industrial/Manufacturing Engineering - System Design (p. 401)
- Usability Studies (p. 402)

Individualized Course of Study in Engineering

Consists of 34 units of an advisor-approved integrated course of study from courses offered in the College of Engineering designed to meet the LAES learning objectives, with at least 12 of the units at the upper division level. Courses must be drawn from at least two engineering disciplines.

Liberal Arts (select one)

- Interactive Communication - Cinematic Focus (p. 402)
- Interactive Communication - Theatrical Focus (p. 402)
- Publishing Technology (p. 402)

- Technical Communication (p. 402)

Individualized Course of Study in the Liberal Arts

Consists of 24 units of an advisor-approved integrated course of study from courses offered in the College of Liberal Arts designed to meet the LAES learning objectives, with at least half of the units at the upper division level.

Students may complete a minor program selected from pre-approved minors. These minors include any minor offered by the College of Liberal Arts, as well as interdisciplinary, cross-college minors in which students complete a minimum of half of the units in the College of Liberal Arts (e.g., Indigenous Studies in Natural Resources & the Environment; Sustainable Environments).

General Education (GE) Requirements

- 72 units required, 20 of which are specified in Major and/or Support.
- See the complete GE course listing (p. 32).
- Minimum of 12 units required at the 300 level.

Area A	Communication	
A1	Expository Writing	4
A2	Oral Communication	4
A3	Reasoning, Argumentation and Writing (4 units in Major) ¹	0
Area B	Science and Mathematics	
B1	Mathematics/Statistics (8 units in Major) ¹	0
B2	Life Science	4
B3	Physical Science (4 units in Major) ¹	0
B4	One lab taken with either a B2 or B3 course	
B5	Area B elective (select one course from B1-B5) (4 units in Major) ¹	0
Area C	Arts and Humanities	
C1	Literature	4
C2	Philosophy	4
C3	Fine/Performing Arts ²	4
C4	Upper-division elective ²	4
Area D/E	Society and the Individual	
D1	The American Experience (Title 5, Section 40404 requirement)	4
D2	Political Economy	4
D3	Comparative Social Institutions	4
D4	Self Development (CSU Area E)	4
D5	Upper-division elective	4
Area F	Technology	
F	Upper-division elective	4
Total units		52

¹ Required in Major; also satisfies GE

² Requirement may be fulfilled if a student takes a GE course to fulfill a concentration requirement. If so the student will need additional free electives to complete the total units required for the degree.

LAES - Engineering - Computer Graphics Concentration

CSC/CPE 101	Fundamentals of Computer Science	4
CSC/CPE 202	Data Structures	4
CSC/CPE 203	Project-Based Object-Oriented Programming and Design	4
CSC/CPE 123	Introduction to Computing	4
CSC 225	Introduction to Computer Organization	4
CSC 303	Teaching Computer Science	2
CSC 348	Discrete Structures	4
CSC/CPE 357	Systems Programming	4
CSC/CPE 471	Introduction to Computer Graphics	4
Total units		34

LAES - Engineering - Electrical Engineering (Power) Concentration

EE 111	Introduction to Electrical Engineering	1
EE 151	Introduction to Electrical Engineering Laboratory	1
EE 112	Electric Circuit Analysis I	2
EE 211	Electric Circuit Analysis II	3
EE 241	Electric Circuit Analysis Laboratory II	1
EE 212	Electric Circuit Analysis III	3
EE 242	Electric Circuit Analysis Laboratory III	1
EE 255	Energy Conversion Electromagnetics	3
EE 295	Energy Conversion Electromagnetics Laboratory	1
EE 335	Electromagnetic Fields and Transmission	4
EE 375	Electromagnetic Fields and Transmission Laboratory	1
EE 406	Power Systems Analysis I	4
EE 407	Power Systems Analysis II	4
EE 444	Power Systems Laboratory	1
Advisor approved power technical elective		4
Total units		34

LAES - Engineering - Industrial/Manufacturing Engineering - System Design Concentration

IME 101	Introduction to Industrial and Manufacturing Engineering	1
IME 223	Process Improvement Fundamentals	4
IME 239	Industrial Costs and Controls	3
IME 301	Operations Research I	4
IME 303	Project Organization and Management	4
IME 314	Engineering Economics	3

IME 319	Human Factors Engineering (IME 320 - Area F) ¹	3-4
or IME 320	Human Factors and Technology	
IME 326	Engineering Test Design and Analysis	4
IME 420	Simulation	4
IME 443	Facilities Planning and Design	4
Total units		34-35

¹ Required in Major; also satisfies GE

LAES - Engineering - Usability Studies Concentration

CSC/CPE 101	Fundamentals of Computer Science	4
CSC/CPE 202	Data Structures	4
CSC/CPE 203	Project-Based Object-Oriented Programming and Design	4
CSC 225	Introduction to Computer Organization	4
CSC 303	Teaching Computer Science	2
CSC 307	Introduction to Software Engineering	4
CSC 348	Discrete Structures	4
CSC/CPE 357	Systems Programming	4
CSC 484	User-Centered Interface Design and Development	4
Total units		34

LAES - Liberal Arts - Interactive Communication-Cinematic Focus Concentration

ENGL 371	Film Styles and Genres (C4) ¹	4
ENGL 411	New Media Arts I	4
TH 210	Introduction to Theatre (C3) ¹	4
Approved Electives		
Select from the following:		12
COMS 311	Communication Theory	
COMS 385	Media Criticism	
COMS 419	Media Effects	
ENGL 372	Film Directors	
ENGL 412	New Media Arts II	
POLS 470	Selected Advanced Topics	
Total units		24

¹ Required in Major; also satisfies GE

LAES - Liberal Arts - Interactive Communication-Theatrical Focus Concentration

ENGL 411	New Media Arts I	4
TH 210	Introduction to Theatre (C3) ¹	4

TH 227	Theatre History I	4
or TH 228	Theatre History II	

Approved Electives

Select from the following: ² 12

ENGL 412	New Media Arts II	
ISLA 320	Topics and Issues in Values, Media and Culture	
TH 220	Acting Methods	
TH 230	Stagecraft I	
TH 330	Stagecraft II	
TH 360	Theatre in the United States	
TH 390	Global Theatre and Performance	
TH 430	Scenic Design	
TH 434	Lighting Design	

Total units 24

¹ Required in Major; also satisfies GE

² No more than one lower division course

LAES - Liberal Arts - Publishing Technology Concentration

GRC 101	Introduction to Graphic Communication	3
GRC 201	Digital Publishing Systems	3
GRC 211	Substrates, Inks and Toners	4
ISLA 303	Values and Technology (C4) ¹	4
or PHIL 341	Professional Ethics	
or PHIL 337	Business Ethics	

Approved Electives

Select from the following: 10

COMS 317	Technology and Human Communication	
GRC 316	Flexographic Printing Technology	
GRC 328	Offset Printing Technology	
GRC 329	Printed Electronics	
GRC 402	Digital Printing and Emerging Technologies in Graphic Communication	

Total units 24

¹ Required in Major; also satisfies GE

LAES - Liberal Arts - Technical Communication Concentration

COMS 317	Technology and Human Communication	4
ENGL 317	Technical Editing	4
ENGL 319	Information Design and Production	4

Approved Electives

Select from the following: 12

COMS 213	Organizational Communication	
----------	------------------------------	--

COMS 301	Business and Professional Communication
ENGL 310	Corporate Communication
ISLA 303	Values and Technology
PHIL 337 or PHIL 341	Business Ethics Professional Ethics
<hr/>	
Total units	24

MS Engineering Management

NOTE: Applications for Winter 2019 or later admission to the Engineering Management program are not currently being accepted. Contact Graduate Education for further information.

Orfalea College of Business

Business Bldg. (03), Room 409

Phone: 805.756.2637

cobgmp@calpoly.edu

<http://www.cob.calpoly.edu/gradbusiness/degree-programs/mba-dual-degree/>

Associate Dean: Sanjiv Jaggia

MBA Program Director: Beena Khurana

Industrial & Manufacturing Engineering

Engineering Bldg. IV (192), Room 235

Phone: 805.756.2540

MS Engineering Coordinator: Jianbiao J. Pan

Academic Programs

Program name	Program type
Engineering Management	MBA/MS

MS Engineering Management is a concurrent degree that includes courses in the MBA program and the MS Engineering program with a specialization in Integrated Technology Management. It is a cooperative effort between the Orfalea College of Business and the Cal Poly College of Engineering (Industrial and Manufacturing Engineering Department). Students are required to have a prerequisite undergraduate bachelor's degree in engineering, computer science, or equivalent technical degree to be admitted to both the College of Engineering and the Orfalea College of Business, and to be enrolled in both degree programs. Successful participants are awarded both MBA and MS in Engineering degrees.

The mission of the MS Engineering Management program is to develop high quality industry-ready graduates who will be facilitators of change and integrators of engineering, business, and people issues.

Admission/Acceptance Requirements

Admission to the EMP is based upon:

- successful completion of an accredited undergraduate program of study in engineering, computer science or equivalent technical degree
- prior academic performance with particular emphasis placed on the last 90 quarter units (60 semester units)
- achievement on the Graduate Management Admission Test (GMAT) or Graduate Record Examination general test (GRE)
- letters of recommendation
- resume and statement of purpose
- prior work experience (desirable)

Culminating Experience

In order to satisfy the culminating experience requirement, students must satisfactorily complete a comprehensive examination in the MBA program *and* satisfactorily complete a comprehensive project in IME 596.

Formal Study Plan

The development and approval of a formal study plan, that fulfills the dual degree requirements, is obligatory. Students will work with the 1) College of Engineering advisor to develop a plan to fulfill the requirements for the MS portion and the 2) Orfalea College of Business advisor to develop a plan to fulfill the requirements for the MBA portion of this concurrent degree program.

Program Learning Objectives

Master of Business Administration

- 1.1 Demonstrate competency in the following areas of business: management, quantitative methods, economics, accounting, finance, marketing, operations, and strategy.
- 1.2 Demonstrate strategic integration of the above areas.
- 1.3 Demonstrate the ability to apply analytics to decision making.
- 2.1 Recognize issues and create solutions using an approach that reflects ethical values.
- 3.1 Demonstrate knowledge of the issues involved in conducting business in a diverse, global environment.
- 4.1 Demonstrate professional written communication skills.
- 4.2 Demonstrate professional oral communication and presentation skills.
- 5.1 Recognize leadership skills and link to leadership theory.
- 5.2 Demonstrate effective team behaviors.

Master of Science in Engineering

1. Summarize and synthesize existing methods/solutions of engineering problems.
2. Solve complex technical and operational problems to meet both business and customer needs.
3. Analyze and interpret quantitative and qualitative data to make sound engineering and business decisions.
4. Communicate engineering ideas/solutions effectively across the entire enterprise.
5. Lead multidisciplinary teams and projects; assess tools and techniques, resources, and organizational systems for successful management of projects.

Required Courses

GSB 511	Accounting for Managers	4
GSB 513	Organizational Behavior	4
GSB 523	Managerial Economics	4
GSB 524	Marketing Management	4
or GSB 573	Marketing Research	
GSB 531	Managerial Finance	4
GSB 533	Aggregate Economics Analysis and Policy	4
GSB 562	Seminar in General Management and Strategy	4
IME 503	Applied Statistical Methods in Engineering ¹	4
IME 507	Graduate Seminar	2
IME 556	Technological Project Management ²	4
IME 577	Engineering Entrepreneurship	4
IME 580	Manufacturing Systems ³	4
IME 596	Graduate Project/Internship	5

College of Engineering Approved Electives ⁴

Select from the following:	23
----------------------------	----

IME 500	Individual Study
IME/AERO 510	Systems Engineering I
IME/AERO 511	Systems Engineering II
IME 520	Advanced Information Systems for Operations
IME 527	Design of Experiments
IME 541	Advanced Operations Research
IME 542	Applied Reliability Engineering
IME 543	Applied Human Factors
IME 544	Advanced Topics in Engineering Economy
IME 545	Advanced Topics in Simulation
IME 570	Selected Advanced Topics
IME 571	Selected Advanced Laboratory

College of Business Approved Electives

Approved Electives	16
Total units	90

¹ Students with a B+ or better grade in IME 326 or IME 327 may substitute IME 503 with another statistics related course from the list of IME 527, STAT 416, STAT 418, STAT 419, STAT 530, and STAT 531 upon approval of the IME graduate coordinator.

² Students with a B+ or better grade in IME 303 may substitute an approved technical elective course upon approval of the IME graduate coordinator.

³ Course cannot be taken by students who have already received credit for IME 410.

⁴ Students may take other 500 level courses after consultation with and approval by advisor and the graduate coordinator.

MCRP/MS Engineering, Specialization in Transportation Planning

College of Engineering
Engineering Bldg. (13), Room 266
Phone: 805.756.2131

City and Regional Planning
Architecture & Environmental Design Bldg. (05), Room 313
Phone: 805.756.1315
<https://planning.calpoly.edu>

Academic Programs

Program name	Program type
Specialization in Transportation Planning	MCRP/MS Engineering

The Transportation Planning Specialization is a joint interdisciplinary program between the College of Engineering (Civil and Environmental Engineering Department) and the College of Architecture and Environmental Design (City and Regional Planning Department). Participation in the program requires enrollment in both Colleges. Participants successfully completing the program are awarded both the MCRP and the MS in Engineering degrees, each with a Specialization in Transportation Planning.

Students come from a diversity of undergraduate backgrounds, which include professionals returning for advanced degrees. The program combines the elements of transportation planning with city and regional planning to address a need for professionals who understand the technology of transportation planning and the importance of transportation within the urban environment. The applied aspects of the curriculum enable students to integrate knowledge and skills in hands-on projects that benefit communities.

MCRP/MS Engineering, Specialization in Transportation Planning

The major objectives of this joint program are to:

1. Demonstrate technical competency.
2. Reflect critical thinking/complex problem-solving skills.
3. Effectively communicate information on issues, problems, solutions, and impacts.
4. Demonstrate strong interpersonal and teamwork skills.
5. Integrate leadership/planning/decision-making skills.
6. Discern the impacts of technology on society and the environment.
7. Practice in accordance with ethics and responsible professional conduct.
8. Develop the appreciation of the need for life-long learning.

Prerequisites

Applicants must have satisfactorily completed courses that cover the following or equivalent subject areas:

- CE 321 Fundamentals of Transportation Engineering and CRP 435 Transportation Theory
- COMS 101 Public Speaking

- ECON 201 Survey of Economics or ECON 222 Macroeconomics
- ENGL 148 Reasoning, Argumentation and Professional Writing or ENGL 149 Technical Writing for Engineers
- MATH 142 Calculus II
- PHYS 141 General Physics IA
- STAT 312 Statistical Methods for Engineers or STAT 321 Probability and Statistics for Engineers and Scientists

Applicants for admission are expected to:

1. Have earned a bachelor's degree from an accredited university or college,
2. Have attained a grade point average of 3.0 in last 90 units of undergraduate work,
3. Provide results of the Graduate Record Examination (GRE) Aptitude Test to the Admissions Committee (GRE requirement may be waived for Cal Poly bachelor of science graduates and applicants with superior academic records).
4. Give indications of motivation, maturity, and high standards of academic involvement through work and references (three letters required) and submission of a project or paper demonstrating writing ability,
5. Provide a current résumé.

Applicants lacking prerequisites or other background requirements for classified standing may be admitted on a conditionally classified basis, depending on the results of an individual analysis of their applications.

Degree Requirements and Curriculum

Core Courses

CE 523	Transportation Systems Planning	4
CE 528	Transportation Economics and Analysis	4
or CE 421	Traffic Engineering	
CE 591	Graduate Seminar I	1
CRP 435	Transportation Theory	4
CRP 501	Foundations of Cities and Planning	4
CRP 504	Sustainable Communities	4
CRP 510	Planning Theory	4
CRP 513	Planning Research and Analysis	4
CRP 516	Demographic and Analytic Tools	4
CRP 518	Policy Development	4
CRP 525	Plan Implementation	4
CRP 530	Planning Agency Management	4
CRP 535	Land Use and Planning Law	4
CRP 552	Community and Regional Planning Studio I	4
CRP 553	Project Planning and Design Studio	4
CRP 554	Community and Regional Planning Studio II	4

Advisor Approved Electives	3-5
----------------------------	-----

Culminating Experience (choose one)

Select from the following:	4-6
CE 599	Design Project (Thesis) (2, 2, 2)
CRP 599	Thesis (2, 2, 2)
CRP 596	Professional Project (2, 2, 2)

CRP 556	Community and Regional Planning Studio III (4)	
Approved CE/ENVE Electives		
Select from the following:		20
CE 421	Traffic Engineering	
CE 422	Highway Geometrics and Design	
CE 423	Intelligent Transportation Systems	
CE 424	Public Transportation	
CE 500	Individual Study	
CE 521	Highway Pavement Designs	
CE 524	Pavement Performance and Management Systems	
CE 525	Airport Planning and Design	
CE 526	Transportation Safety	
CE 527	Sustainable Mobility	
CE 528	Transportation Economics and Analysis	
CE 529	Modeling and Simulation in Transportation	
CE 570	Selected Advanced Topics	
CE 571	Selected Advanced Laboratory	
ENVE 411	Air Pollution Control	
Other advisor approved CE/ENVE courses		
Total units		90

GRADUATE EDUCATION

Graduate Education
Science Bldg. (52), Room E47
Phone: 805.756.2328; Fax: 805.756.2299

Prospective Graduate Students

Cal Poly offers over 50 master's degree programs covering all of our six colleges:

- College of Agriculture, Food and Environmental Sciences (CAFES)
- College of Architecture and Environmental Design (CAED)
- Orfalea College of Business (OCOB)
- College of Engineering (CENG)
- College of Liberal Arts (CLA)
- College of Science and Mathematics (CSM) & School of Education (SOE)

A complete listing of our graduate programs can be found on the Graduate Programs site at <http://grad.calpoly.edu/index.html>.

Application for Admission

An application for admission to a Master's program is available at www.calstate.edu/apply (<http://www.calstate.edu/apply>). The CSU Apply system allows students to browse through general information about CSU's twenty-three campuses, view multimedia campus presentations, send and receive electronic responses to specific questions, and apply for admission and financial aid.

All graduate and post-baccalaureate applicants (e.g., master's degree applicants, those seeking educational credentials, or graduate certificates) must file a complete graduate application as described in the graduate and post-baccalaureate admission materials at <https://admissions.calpoly.edu/>. Applicants who completed undergraduate degree requirements on a CSU campus and graduated the preceding term are also required to complete and submit an application and pay the \$55 nonrefundable application fee.

The CSU advises prospective students that they must supply complete and accurate information on the application for admission, residence questionnaire, and financial aid forms. Further, applicants must submit authentic and certified transcripts of all previous academic work attempted. Official transcripts must also be sent directly from the issuing institution to the Cal Poly Admissions Office. Failure to complete, accurate, and authentic application documents may result in denial of admission, cancellation of academic credit, suspension, or expulsion (Section 41301, Article 1.1, Title 5, *California Code of Regulations*).

Applicants for graduate programs should contact the Cal Poly Admissions Office (<https://admissions.calpoly.edu/applicants/graduate>) for program specific deadlines. All Cal Poly graduate programs require applicants to complete the GRE. However exceptions may be granted to specific programs; check with the Graduate Education website for requirements for each program <http://grad.calpoly.edu/index.html>.

Applicants who earned a Cal Poly bachelor's degree within the last seven years will be granted an exemption from the GRE requirement; however, specific programs may waive this exemption and require the GRE for all applicants. Please keep in mind that any applicant (external or Cal Poly undergraduate) with an undergraduate GPA of 2.5 or lower will be required to take the GRE and demonstrate results that are at the

50-percentile or higher (Quant, Verbal & Writing) to be considered for admission.

Admission to Professional Certificates

All professional certificate applicants must file a complete application by following the links provided on the Graduate Education website (<http://grad.calpoly.edu/applicant/professional-certificate.html>) for each certificate. Applications can be completed anytime through the year. Applicants must supply complete and accurate information along with un-official transcripts documenting academic work associated with their bachelor's degree. Failure to file complete, accurate, and authentic documents may result in denial of admission, cancellation of academic credit, suspension, or expulsion (Section 41301, Article 1.1, Title 5, *California Code of Regulations*).

Contact the Cal Poly Extended Education Office (<http://www.extended.calpoly.edu>) if you have questions about the application process. Extended Education does not guarantee that Professional Certificate courses will be offered unless adequate enrollments are realized.

Graduate and Postbaccalaureate Admission Requirements

Graduate and post-baccalaureate applicants may apply for a degree objective, a credential or graduate certificate objective. Depending on the objective, the CSU considers an application for admission as follows:

- **General Requirements** – The minimum requirements for admission to graduate and post-baccalaureate studies at a California State University campus are in accordance with university regulations as well as Title 5, chapter 1, sub-chapter 3 of the *California Code of Regulations*.
- Specifically, a student shall at the time of enrollment:
- have completed a four-year college course of study and hold an acceptable baccalaureate degree from an institution accredited by a regional accrediting association, or shall have completed equivalent academic preparation as determined by appropriate campus authorities;
- be in good standing at the last college or university attended;
- have attained a grade point average of at least 2.5 (A = 4.0) in the last 60 semester (90 quarter) units attempted or have earned a grade point average of at least 2.5 on the last degree completed by the candidate; and
- satisfactorily meet the professional, personal, scholastic, and other standards for graduate study, including qualifying examinations, as appropriate campus authorities may prescribe. In unusual circumstances, a campus may make exceptions to these criteria.
- A student who meets the minimum requirements for graduate and post-baccalaureate studies may be considered for admission in one of the four following categories:
 - **Graduate Classified** – To pursue a graduate degree, applicants are required to fulfill all of the professional, personal, scholastic, and other standards, including qualifying examinations, prescribed by the campus.
 - **Graduate Conditionally Classified** – Applicants may be admitted to a graduate degree program in this category if, in the opinion of appropriate campus authority, deficiencies can be remedied by additional preparation.

- **Post-Baccalaureate Classified** – e.g., admission to an education credential program – Persons wishing to enroll in a credential or certificate program, will be required to satisfy additional professional, personal, scholastic, and other standards, including qualifying examinations, prescribed by the campus.
- **Post-Baccalaureate Unclassified** – To enroll in undergraduate courses as preparation for advanced degree programs or to enroll in graduate courses for professional or personal growth, applicants must be admitted as post-baccalaureate unclassified students. By meeting the minimum requirements, applicants are eligible for admission as post-baccalaureate unclassified students. Admission in this status does not constitute admission to, or assurance of consideration for admission to, any graduate degree or credential program. (Most CSU campuses do not offer admission to unclassified post-baccalaureate students).

Residency Status Determination

The campus Admissions Office determines the residency status of all new and returning students for nonresident tuition purposes. Responses to the application for admission and, if necessary, other evidence furnished by the student are used in making this determination. A student who fails to submit adequate information to establish a right to classification as a California resident is classified as a nonresident. For detailed explanation please refer to <https://admissions.calpoly.edu/applicants/mycalpoly/resinfo.html>.

International (Foreign) Student Admission Requirements

The CSU must assess the academic preparation of foreign students. For this purpose, "foreign students" include those who hold U.S. temporary visas as students, exchange visitors, or in other non-immigrant classifications. The CSU uses separate requirements and application filing dates in the admission of "foreign students". All graduate and post-baccalaureate applicants, regardless of citizenship, whose native language is not English and whose preparatory education was principally in a language other than English must demonstrate competence in English. Those who do not possess a bachelor's degree from a post-secondary institution where English is the principal language of instruction must take either the Test of English as a Foreign Language (TOEFL) or the International English Language Testing system (IELTS) exam.

The Office of Admissions completes an initial portfolio review that includes verification of an equivalent B.A./B.S. degree, a determination of the appropriate level of study and an evaluation of all work completed. The Office of Admissions notifies all applicants of the documents needed to complete their portfolios. Graduate coordinators may require additional documentation to assist them in determining an applicant's suitability for the program of study.

The process for filing an international application can be found at <https://admissions.calpoly.edu/applicants/international>.

Master's Degrees

In graduate courses, students cope with more complex ideas, problems, techniques and materials than in undergraduate courses. Graduate study requires searching and exhaustive analysis, identification and investigation of theories and principles; application of theory to new ideas, problems, and materials; extensive use of bibliographic and other resource materials, with emphasis on primary sources for data; and

demonstration of competence in scholarly presentation of the results of independent study.

Regulations governing fees, grading, and financial aid are located elsewhere in the catalog. This section of the catalog reviews university policy and minimum requirements governing graduate studies. It is not, however, all inclusive.

Within these general requirements there are specific departmental requirements for each degree. These are found in the descriptions of master's degree programs within each school's description. It is important that graduate students, in consultation with their advisors, familiarize themselves with these requirements. Failure to do so may result in a substantial delay in progress towards the degree and graduation. It is the responsibility of the student to ascertain and comply with all university, college and departmental procedures and requirements.

- All available master's degree programs, graduate certificates and professional certificates can be found on the graduate education website <http://grad.calpoly.edu/applicant/professional-certificate.html>. (<http://grad.calpoly.edu/programs>)

Master's Degree Programs

- Accounting, MS (p. 188)
- Aerospace Engineering, MS (p. 198)¹
 - Research Specialization (p. 202)
- Agricultural Education, Master of (p. 83)
- Agriculture, MS (p. 64)
 - BioResource and Agricultural Systems Specialization (p. 68)
 - Animal Science Specialization (p. 68)
 - Crop Science Specialization (p. 69)
 - Dairy Products Technology Specialization (p. 69)
 - Environmental Horticulture Specialization (p. 69)
 - Food Science Specialization (p. 69)¹
 - Irrigation Specialization (p. 70)
 - Plant Protection Science Specialization (p. 70)
 - Soil Science Specialization (p. 70)
- Architectural Engineering, MS (p. 156)¹
- Architecture, MS (p. 159)
- Biological Sciences, MA (p. 354), MS (p. 354)
 - Specialization in Regenerative Medicine (p. 354)
- Biomedical Engineering, MS (p. 207)¹
 - Specialization in Regenerative Medicine (p. 207)
- Business Administration, MBA (p. 175)
 - General Management Specialization (p. 188)
 - Graphic Communication Document Systems Management Specialization (p. 188)
- Business Analytics, MS (p. 189)
- City and Regional Planning, MCRP (p. 165)
- Civil and Environmental Engineering, MS (p. 214)¹
- Computer Science, MS (p. 230)¹
- Curriculum and Instruction, MA (p. 393)
- Dairy Products Technology, MPS (p. 93)
- Education, MA (p. 388)
 - Counseling and Guidance Specialization (p. 391)

- Curriculum and Instruction Specialization (p. 392)
- Educational Leadership and Administration Specialization (p. 392)
- Special Education Specialization (p. 392)
- Educational Leadership and Administration, MA (p. 393)
- Electrical Engineering, MS (p. 236)¹
- Engineering, MS (p. 192)¹
 - Biomedical Engineering Specialization (p. 196)
 - Integrated Technology Management Specialization (<http://catalog.calpoly.edu/collegesandprograms/collegeofengineering/msengineeringsspecializationinintegratedtechnologymanagement>)¹
 - Water Engineering Specialization (p. 196)
- Engineering Management, MS (p.)
- Engineering, Specialization in Transportation Planning MCRP/MS (p. 406)
- English, MA (p. 271)¹
- Fire Protection Engineering, MS (p. 196)
- Forestry Sciences, MS (p. 144)
- Higher Education Counseling and Student Affairs, MS (p. 393)
- History, MA (p. 284)
- Industrial Engineering, MS (p. 245)¹
- Kinesiology, MS (<http://catalog.calpoly.edu/collegesandprograms/collegeofsciencemathematics/kinesiology/mskinesiology>)
- Mathematics, MS (p. 381)¹
- Mechanical Engineering, MS (p. 256)¹
- Nutrition, MS (p. 116)
- Packaging Value Chain, MS (p. 189)
- Polymers and Coatings Science, MS (p. 361)¹
- Psychology, MS (p. 314)
- Public Policy, MPP (p. 308)
- Quantitative Economics, MS (p. 189)
- Special Education, MS (p. 394)
- Taxation, MS (p. 190)

¹ Blended BS+MS programs available. See individual program for information.

Graduate Certificate Programs

An academic graduate certificate program declares that a student has satisfactorily completed a sequence of advanced academic courses that provide instruction in a stand-alone, coherent body of specialized knowledge. It is designed to meet requirements for professional competence, expand access to specialized knowledge, or meet occupational needs for advanced interdisciplinary work.

Specific Requirements:

- Admission to a graduate certificate program requires a Bachelor's degree from an accredited institution with a major in a relevant field of study. The applicant must have attained a minimum GPA of 2.5 in the last 90 units attempted or have earned a GPA of at least 2.5 in the last degree completed. Work experience may substitute (at the discretion of the program) for the relevancy of the Bachelor's degree and for the minimum GPA requirements.
- Courses taken to satisfy the requirements of a graduate certificate program may be applied to the requirements of a graduate degree

program; however, students must apply separately for admission into a graduate degree program. No course-work for the certificate may be below the 400 level. One 4-unit course in transfer credit, from a regionally accredited institution, may be allowed as determined by the graduate certificate program advisor.

- A minimum GPA of 3.0 is required for successful completion of a graduate certificate program. Students may not elect to take courses required for the certificate as credit/no credit. A graduate certificate program must be completed within three years.
- Students who are enrolled only in a graduate certificate program are exempt from the continuous enrollment requirement for graduate students.

Certificate Programs:

- Fire Protection Engineering Applications (p. 197)
- Fire Protection Engineering Science (p. 197)

Academic Requirements Graduate Student Continuous Enrollment Policy

Effective Fall Quarter 2009, graduate students are required to maintain continuous enrollment from the time of first enrollment in a graduate program until completion of the degree (AS-692-09). Continuous enrollment is defined as being enrolled during Fall, Winter, and Spring quarters each year. All graduate students must be enrolled during the quarter in which they graduate. Therefore, a student graduating Summer quarter must be enrolled during the summer. Students can maintain continuous enrollment by being enrolled as regular students; obtaining approval for an education or medical leave prior to the quarter when such a leave would begin; or registering in a special course designated for this purpose during quarters in which they are not regularly enrolled. The special course, GS 597, is listed in the University catalog and is taken through Cal Poly Extended Education. GS 597 is a one-unit course, offered credit/no credit; credits in GS 597 do not count toward meeting degree requirements. Students who fail to fulfill this continuous enrollment requirement will not be permitted to graduate—even if all degree requirements have been completed—until payment has been made for all quarters of non-enrollment. This requirement is not retroactive to terms prior to Fall 2009.

For further information and a registration form, visit the Extended Education website at: <http://grad.calpoly.edu/policies/policies-guidelines.html>

Degree Requirements

The following conditions and academic requirements are common to all Master's degrees:

- All student must attempt to satisfy the **Graduation Writing Requirement** (EO 665.11.0) during the first quarter of enrollment. Master's students must successfully pass this requirement before their degree can be awarded.
- A student must file an approved Working Formal Study Plan with a minimum of **45 quarter units** (Title 5, Article 7, 40510 b.2.) before the twelfth unit of graduate study is completed.
- A student must maintain an overall **grade point average of 3.0** (grade of B on a scale where A = 4.0), or better, based on all courses listed in the Formal Study Plan. A course in which a 'CR' is assigned shall

not be used in computing the grade point average. (Title 5, Article 7, 40510 b.4.)

- Only individual graded courses with C- or higher can be used on the Formal Study Plan. See the grade section for more details.
 - A student must maintain **satisfactory scholarship and professional standards**. Only those graduate students who continue to demonstrate a satisfactory level of scholastic competence and fitness, as determined by the appropriate university authorities, shall be eligible to continue in such curricula. Students whose performance is judged to be unsatisfactory by the authorities of the University may be required to withdraw from all graduate degree curricula offered by the University.
 - A student must successfully complete a **culminating experience** (thesis, project, and/or comprehensive examination). (Title 5, Article 7, 40510 b.3.)
 - A student must complete all of the graduate degree requirements within **seven years** (Title 5, Article 7, 40510 b.2.) of being matriculated, even conditionally, into *that* Master's degree-seeking program.
 - A student may elect to meet the **catalog** graduation requirements in effect at the time the student was admitted to graduate standing (conditional or classified) provided that continuous enrollment was maintained (AS-692-09), or at the time of graduation. The student may be required to make substitutions for discontinued courses by submitting a new Formal Study Plan.
 - Graduate level courses (**500-level**) **should make up no fewer than 50%** of the units required for the degree (Title 5, Article 7, 40510 b.2.B.); note that per Academic Senate Resolution AS-825-17 (https://content-calpoly.edu.s3.amazonaws.com/academicsenate/1/images/AS-825-17_0.pdf) all students admitted starting Fall 2019 will be required to have 60% of their Formal Study Plan courses at the 500-level.
 - The majority of the Formal Study Plan coursework should be taken while enrolled through Cal Poly's state-supported system (Title 5, Article 7, 40510.A). Cal Poly requires that at least 33 units of a 45-unit program must be completed while in residence at Cal Poly; a limit of 12 units out of residence can be taken. In programs with more than 45 units an equivalent proportion (33/45 or 73%) of units must be taken in residence at Cal Poly.
 - In residence
 - Cal Poly undergraduate courses
 - Cal Poly summer session ('S') courses (EO 1099 9.1 & 10.2)¹
 - Only up to 12 units of Cal Poly Open University ('P') courses¹
 - Out of Residence (max 12/45 units or 27%)
 - Extended Education ('E') courses (EO 1099 9.2)¹
 - Credit by exam units
 - Transfer units²
 - The majority of Formal Study Plan coursework should be taken *after* having been matriculated at Cal Poly as a Graduate Classified or Graduate Conditionally Classified (both seeking a master's degree), or Post-baccalaureate Classified (credential or academic graduate certificate) student. Therefore, Cal Poly limits units taken outside of the Post-baccalaureate or Graduate Classified standing; only **12 unclassified** AND only **12 Cal Poly undergraduate** units can be used on the Formal Study Plan.
 - Post-baccalaureate or Graduate Classified
 - Courses taken (here or in transfer²) *after* having been matriculated into a Cal Poly master's, credential, or academic graduate certificate program
 - Not Post-bacc/Grad Classified – (max 24 units total)
 - Unclassified (max 12 units)
 - All transfer² and Cal Poly post-baccalaureate enrollment (including professional certificate enrollment) *before* being matriculated into a Cal Poly's master's, credential, or academic graduate certificate program
 - Cal Poly Undergraduate enrollment (max 12 units)
 - Coursework taken as a Cal Poly undergraduate student, but not needed to meet any baccalaureate degree requirement
 - No more than 24 quarter units of approved Cal Poly **Extended Education** [a combination of Summer Session (S), Open University (P), or Special Session (E) courses] courses shall be accepted for the Master's degree. (EO 1099 10.1.2)
 - No more than nine quarter units shall be in **student teaching**.
 - No more than nine quarter units shall be allowed for a **thesis or project** (Title 5, Article 7, b.2.C.).
 - Enrollment in these units must be as a Master's matriculated student, therefore cannot be enrolled through Extended Education.
 - Note: Some programs/departments set independent study limits on courses, found in the course description. Typically there is a 12-unit combined maximum of independent study units allowed.
- ¹ No more than 24 quarter units of approved Cal Poly Extended Education [a combination of Summer Session (S), Open University (P), or Special Session (E) courses] courses shall be accepted for the Master's degree. (EO 1099 10.1.2)
- ² Transfer units must come from a regionally accredited institution.

Time Limit for Degree

The time allowed to successfully complete all Master's requirements, including the Master's Culminating Experience Approval Form, is seven years (Title 5, Article 7, 40510 b.2.) from the time the student is matriculated, even conditionally, into that Master's degree-seeking program.

The University, at its option, and in exceptional cases, may extend the time frame. Students who wish to extend the seven-year limit must submit a Graduate Petition for Special Consideration to Graduate Education. The petition must include:

- An explanation of the reasons why the extension is necessary.
- Evidence to support the student's currency in the field of study.
- A copy of the student's Final Formal Study Plan that indicates any additional coursework that needs to be completed as part of this petition and which of those courses will be over seven years old at the proposed time of completion.
 - If the extension is necessary for completion of the culminating experience, list the specific experience being used (thesis, project, or comprehensive exam).
- Indicate the current progress made on the culminating experience and when final degree requirement completion is expected.

- The seven-year rule cannot be extended indefinitely; the student must specify in the petition what quarter and year they will be completing all degree requirements, thus indicating precisely how far the seven-year rule will be extended.

Graduation Writing Proficiency (GWR)

The Board of Trustees of the California State University has mandated that all students earning undergraduate or graduate degrees in the CSU must be certified as proficient in writing (EO 665-11). In accordance with this mandate, all Cal Poly students must demonstrate competency in writing skills as a requirement for graduation.

Graduate students seeking a Master's Degree or credential should fulfill the GWR during their first quarter at Cal Poly. Note: Students who do not complete the GWR will not be Advanced to Candidacy. Also note that Blended program students must satisfy the GWR before they will be advanced to graduate standing.

The GWR may be satisfied, at the discretion of the Writing & Rhetoric Center, if certain criterion was met prior to post-baccalaureate enrollment. See the center's website (<https://writingcenter.calpoly.edu>) for more details.

Graduate students who cannot submit materials suitable for GWR substitution should review their program requirements and determine which of the following GWR completion pathways is appropriate:

1. Pass the Writing Proficiency Exam (WPE). Details can be found on the Writing & Rhetoric Center's website (<https://writingcenter.calpoly.edu/content/gwr/wpe/wpe>).
2. Earn *both* a grade of C or better (C- does not qualify) *and* a certification of writing proficiency based on a 500- to 800-word, in-class essay in a GWR-approved course selected from the eligible classes listed on PASS.
 - Note: Although students can take the course on a CR/NC basis, they are discouraged from doing so because the student must then earn a B- or better instead of a C or better in order to earn GWR and course credit.

Further information on the GWR may be obtained from the Writing & Rhetoric Center at 805.756.2067 or on their webpage at <https://writingcenter.calpoly.edu/>.

General Policies Advisement

Master's students should make an appointment with their graduate advisor during their first quarter of being enrolled in that program to develop a Working Formal Study Plan for their Master's degree: an agreement between the student and the university on the specific coursework to be completed in order to fulfill the requirements for the Master's degree (minimum 45 units). A Working Formal Study Plan must be submitted to the Graduate Education Office (Bldg. 52-E47) for review by the end of the 1st quarter of starting that program at Cal Poly. It is understood that changes may occur to this plan as students make progress with their studies; changes in the Working Formal Study Plan do not need to be submitted to the Graduate Education Office. However, students must submit a Final Formal Study Plan within the first 3 weeks of the quarter in which they expect to graduate. This Final Formal Study

Plan must accurately reflect the courses that have been completed to satisfy their program requirements.

Each Master's degree program has specific prerequisites, both in courses and in grade-point average. Deficiencies in prerequisites must be defined by the graduate coordinator in the conditional acceptance offer, and the graduate coordinator is responsible for verifying prerequisite compliance prior to the submission of the Advancement to Candidacy. Courses taken for this purpose normally do not count toward fulfillment of the unit requirement for the degree.

Departmental advisors and graduate coordinators share the responsibility for advising Master's degree students throughout their work toward a degree. Students are urged to maintain a personal file of transcripts and other records of all undergraduate and graduate work undertaken, and to make this file available whenever they seek advising.

Post-Baccalaureate Change of Objective

If students wish to change their post-baccalaureate objective, they must formally file this intention by completing a Post-baccalaureate Change of Objective (PBCO) form, available at www.grad.calpoly.edu. Students applying to blended Bachelor's/Master's programs need to follow the guidelines under that section. A student must be enrolled for one quarter in the program that they were admitted before filing PBCO.

Formal Study Plan

The student should make an appointment with their Graduate Program Coordinator during their first quarter of graduate study to develop a Working Formal Study Plan for the Master's degree. A formal study plan is an agreement between the student and the college on the specific coursework to be completed in order to fulfill the course requirements for the Master's degree. The student should always consult with their advisor to ensure that only approved courses are selected, since departmental requirements vary and some courses are excluded. A copy of the study plan must be submitted to Graduate Education for review and final approval.

Courses below the 400-level may not constitute any part of the approved units on the Formal Study Plan (AS-313-89). However, in those programs where specific courses below the 400-level may be essential for a student's success, the student may be conditionally admitted to the program contingent upon completing those courses. Do not list any prerequisite courses on the Formal Study Plan.

Graduate Courses Taken by Undergraduates for Graduate Credit

Cal Poly undergraduates may take courses in the 400 or 500 series for graduate credit while still matriculated as undergraduates. If they subsequently enter a Cal Poly Master's, credential, or academic certificate program, they may have such course credit applied toward that program, only if the units were not used for the baccalaureate degree. Students must list these courses taken as an undergraduate in the appropriate place on the Formal Study Plan. No more than 12 units of Cal Poly undergraduate work is allowed on the Formal Study Plan.

Cal Poly's Office of the Registrar will validate if Cal Poly undergraduate courses listed on the Formal Study Plan were not needed to meet any undergraduate degree requirement. However, students who want to use undergraduate courses from another institution must provide Cal Poly's Office of the Registrar with an official letter from the other regionally

accredited institution indicating that the coursework was not needed to meet any undergraduate degree requirement.

Advancement to Candidacy

Advancement to Candidacy (Title 5, Article 7, 40510a & 41011) recognizes that the student has, so far, sufficiently demonstrated the ability to operate at and sustain a level of scholarly competence that is satisfactory for successful completion of the degree requirements. The student is then cleared for the final stages of the program, which, in addition to any remaining coursework, includes the thesis, project, and/or comprehensive examination.

The Advancement to Candidacy form must be submitted by the end of the third quarter of enrollment. A student's signature on the form signifies understanding of the 3.0 GPA requirement for Formal Study Plan courses and compliance with the Continuous Enrollment Policy. The form will be processed only when:

- A Working Formal Study Plan has been submitted and approved.
- The Graduate Writing Requirement (GWR) has been satisfied.
- The Culminating experience has been identified as either a thesis, a project, and/or an exam.
 - For a thesis, all members of the thesis committee must be identified.
 - For a project, the project advisor must be identified.

Culminating Experience/Research

The student must successfully complete the culminating experience required by the specific program (thesis, project, and/or comprehensive examination) to be granted a graduate degree (Title 5, Article 7, 40510 b.3.). The quality of work accomplished, including the quality of the writing, is the major consideration in judging the acceptability of the thesis, project, and/or comprehensive examination. Note: The degree award date is based on the submission of the Master's Culminating Experience Approval Form to the Graduate Education Office.

Thesis

"A thesis is the written product of a systematic study of a significant problem. It identifies the problem, states the major assumptions, explains the significance of the undertaking, sets forth the sources for and methods of gathering information, analyzes the data, and offers a conclusion or recommendation. The finished product evidences originality, critical and independent thinking, appropriate organization and format, and thorough documentation. Normally, an oral defense of the thesis is required." (Title 5, Article 7, 40510 b.3.A.)

The following are requirements for a thesis committee: 1) that the graduate student have a thesis advisor who is a permanent full-time faculty member from the student's program; 2) that the thesis advisor and the student recommend, for approval by the graduate coordinator and/or department head, a thesis committee comprising of at least three faculty members; 3) that two of these members, one of which is the committee chair, be from the student's program. Exceptions to the thesis committee composition must be approved by the College Dean.

If a thesis report is required in a Master's degree program, a committee-approved copy must be completed in accordance with university specifications. Guidelines to be followed in preparing a final copy for filing with the University can be obtained from Graduate Education, or online at www.grad.calpoly.edu.

All Master's theses must go through Graduate Education's Thesis Formatting Review Process wherein an Editor reviews and provides the student with needed corrections. Upon completion of any corrections required by the Editor or thesis committee, the student submits the electronic thesis report to the DigitalCommons@CalPoly, a digital archive for the University.

Project

"A project is a significant undertaking appropriate to the fine and applied arts or to professional fields. It evidences originality and independent thinking, appropriate form and organization, and a rationale. It is described and summarized in a written report that includes the project's significance, objectives, methodology, and a conclusion or recommendation. An oral defense of the project may be required." (Title 5, Article 7, 40510 b.3.B.)

The following are requirements for a project: 1) that the graduate student have a project advisor who is a permanent full-time faculty member from the student's program; 2) a project may also include a committee that must be approved by the graduate coordinator and/or department head. Project reports do not have to be submitted to Graduate Education and typically are not uploaded to the Digital Commons@CalPoly.

Comprehensive Examination

"A comprehensive examination is one of the possible culminating experiences for the Master's degree and assesses "the student's ability to integrate knowledge of the area, show critical and independent thinking, and demonstrate mastery of the subject matter. The results of the examination should provide evidence of these abilities and achievement. A record of the examination questions and responses shall be maintained..." (Title 5, Article 7, 40510 b.3.C.).

Research Involving Special Conditions

Research that involves the use of human subjects, vertebrate animals, hazardous materials, or information and materials subject to export-control regulations requires special campus review before the study begins. If your research involves any of these special conditions, check with your Graduate Coordinator and Graduate Education for procedures.

Grades/Repeats

Report In Progress (RP) Grades

The grade of RP is used in connection with courses that extend beyond one academic term. It indicates that work is in progress and has been evaluated and found to be satisfactory to date, but that assignment of a grade must await completion of additional work. Work is to be completed within a time period stipulated by the instructor. The RP symbol shall be replaced with the appropriate final grade within one year for all courses or will convert to an F for graded courses or NC for CR/NC-only courses.

There is an exception for graduate degree theses or project courses (539/596/598/599) for which the time may be up to seven years, but may not exceed the overall time limit for completion of all Master's degree requirements (AS-647-06). Failure to complete the assigned culminating experience work will result in the RP, only in these courses, being converted to an NC (AS-443-95).

Earned D+ or Lower

If a student earns a D+ or lower, the course can be retaken with the permission of the student's program and both grades will be averaged into the Formal Study Plan. Alternately, if the course is not required, it

can be removed from the Formal Study Plan and replaced with a suitable alternative.

Repeating a Course

Students may enroll in a course for credit more than once only if the catalog course description states that the course may be repeated for credit. An exception to this policy allows the repeating of a course in cases where a grade of D or F was received. Unlike for undergraduates at Cal Poly, a graduate student repeating a course cannot qualify for the removal of a lower letter grade from the overall GPA calculation on the student's transcript. See the [Earned D+ or Lower](#) section above for more information.

Credit/No Credit Grading

Courses which are offered only on a credit/no credit basis also satisfy the unit requirement if a credit grade is earned. The equivalent of an A or a B (including a B-) is required to earn credit in such courses (AS-8-76). Graduate students may elect to take courses that are not part of their Formal Study Plan on a credit/no credit basis.

Registration

The schedule and instructions for registration and payment of fees are available through the registration and enrollment tab at the MyCalPoly web portal. Detailed descriptions of courses can be found here (p. 500).

Enrollment/Prerequisites

To enroll in a 500-level graduate course a student must have post-baccalaureate/graduate standing or the permission of the instructor. Note, prerequisites are not waived for 400-level courses; a graduate student may need to get a permission number from the instructor teaching that course to enroll in a 400-level course.

Credit by Exam for Coursework

See Evaluation of Transfer Credit (p. 52).

Status

Full-Time Status

A full-time graduate student is defined as one taking 8 or more units in a quarter. Students receiving financial aid may need to meet different requirements to be considered full-time and should consult with the Financial Aid Office. Graduate students are not permitted to enroll in more than 22 units each quarter.

Leaves of Absence

Educational, medical and military leaves are permitted if students meet the eligibility requirements and submit a Leave of Absence form with the required signatures and documentation to the Office of the Registrar. The maximum duration for any single Leave of Absence is 6 academic quarters (not including summer).

See undergraduate section (p. 59).

Discontinuation

Matriculated students who have not registered for three consecutive quarters and have not been on an approved Leave of Absence will be discontinued and will not be allowed to enroll. To enroll again, students must apply for readmission before the deadline dates listed below for each quarter. An application fee must accompany the application for readmission. <https://admissions.calpoly.edu/applicants/returning/>

A graduate student who has been discontinued but has completed all required degree requirements except for their culminating experience (thesis, project, and/or exam) may be able to return to Cal Poly to receive their Master's degree without reapplying to their Master's program. The student is encouraged to speak directly with the Graduate Education Office for more information.

Matriculated students who have not registered for one quarter or two consecutive quarters are entitled to their registration priority without applying for readmission.

Application Deadlines for Returning Students (<https://admissions.calpoly.edu/applicants/returning>)

Graduation

A student planning to graduate must file a Request for Graduation Evaluation form with the Graduate Education Office the quarter before the student intends to participate in the appropriate commencement ceremony (either in December or June). The student should only submit the form after both the Working Formal Study Plan and Advancement to Candidacy have been approved. A student cannot graduate without this application, available at www.grad.calpoly.edu. **It is the student's responsibility to ensure that all of their necessary forms have been signed and approved.**

Students can confirm that they will appear on the bookstore list (which allows them to purchase a cap and gown) and the Commencement Bulletin by checking their status on Poly Profile only after all of their paperwork has been received in and processed by the Office of the Registrar. On the Poly Profile, under the Career Program Plan section and the Postbaccalaureate Graduate career, students will see an "Expected graduation is..." notation once the paperwork has been processed. Corresponding deadlines for these items are communicated to students via email from Graduate Education.

Note that, despite participation in commencement ceremonies, students are not official Cal Poly graduates until they have completed ALL degree requirements satisfactorily and have received a 'Congratulations' email from the Office of the Registrar, Evaluations Unit.

Academic Excellence

Master's degree candidates who are academically in the top 10 percent of their program and are recommended by their Graduate Program Coordinator are eligible to be recognized for Academic Excellence. Nominations must be approved by the appropriate College Dean. If approved, the student will be permitted to wear "**honor cords**" at Commencement. Students can contact their Graduate Program Coordinator for details.

Note that Latin honors (summa, magna, cum laude) are only for undergraduate degrees.

Distinction

Graduation with Distinction will be determined by the Office of the Registrar only at the time of degree posting. **It will NOT be noted or awarded at the Commencement Ceremonies.** Instead, the designation will appear on a student's final transcript and diploma. The criterion for graduation with distinction is a Final Formal Study Plan grade point average of 3.75 or better.

June Only Commencement Awards

Faculty in each Master's program should make recommendations for the **Outstanding Graduate Student** and the **Outstanding Graduate Thesis** awards to the appropriate Graduate Coordinator by May 1. For a program having more than 50 students, two nominations per award can be made. Finalists for the awards may be asked to supply additional information or material to a review committee appointed by the Dean of Graduate Education. The students selected for these awards will be recognized only at the Spring Commencement ceremony.

Conduct/Probation/Disqualification/Dismissal

Student Conduct and Discipline

It is expected that all Cal Poly students are enrolled for serious educational pursuits and that they conduct themselves so as to preserve an appropriate atmosphere of learning. It is also expected that all students who enroll at Cal Poly are willing to assume the responsibilities of citizenship in the campus community. Association in such a community is voluntary, and students may withdraw from their graduate programs any time they consider the obligations of membership disproportionate to the benefits. While enrolled, students are subject to campus authority that includes the prerogative of dismissing those whose conduct is inimical to the aims of an institution of higher education. While enrolled, students are subject to the regulations governing discipline stated in Education Code Section 66017 and in Title 5 of the California Code of Regulations, Sections 41301–41302, and to such rules and regulations as have been approved and promulgated by authority of the University President. Students are subject to other applicable regulations contained in this Catalog, in the Campus Administrative Policies, the Standards for Student Conduct, Rights and Responsibilities, and in other official university publications, including the Cal Poly website.

Academic Probation

A student who is enrolled in a graduate degree program in conditionally classified or classified standing may be placed on academic probation for failure to maintain a cumulative grade point average of at least 3.0 (grade of B on a scale where A = 4.0) in all courses in the Formal Study Plan for the degree.

A student who has been admitted as post-baccalaureate classified in order to pursue a credential program shall be subject to academic probation for failure to maintain a cumulative grade point average of at least 3.0 in all units taken in the credential program.

A post-baccalaureate unclassified student (one who has not been admitted to either a credential or graduate degree program) shall be subject to academic probation for failure to maintain a cumulative grade point average of at least 2.5 in all units attempted subsequent to admission to post-baccalaureate standing.

Academic Disqualification

A graduate or post-baccalaureate student who has been placed on academic probation may be disqualified from further attendance in a program by action of the Dean of the college (or the Dean's designate) in which the student is enrolled and in consultation with the Dean of Graduate Education for any of the following reasons:

1. The conditions for removal of academic probation are not met within the period specified.

2. The student goes on administrative probation while on academic probation.
3. The student is subject to administrative probation for the same or similar reason for which the student has been placed on academic probation previously, although not currently in such status.

When such action is taken, the student is notified via email from the Dean of Graduate Education that includes an explanation of the basis for the action. Disqualification may be either from further registration in the program or from further enrollment at the University as determined by the Dean of Graduate Education.

Administrative Probation

A graduate student may be placed on administrative-academic probation by action of the Dean of the College (or the Dean's designate) in which the student is enrolled for any of the following reasons:

1. Withdrawal from all or a substantial portion of a program of study in two successive quarters or in any three quarters. (Note: a student who is on an approved Leave of Absence is not subject to administrative-academic probation for such withdrawal.)
2. Repeated failure to make progress toward the stated degree or program objective when such failure appears to be due to circumstances within the control of the student.
3. Failure to comply, after due notice, with an academic requirement or regulation which is routine for all students or a defined group of students (for example, failure to complete a required campus or program examination, failure to complete a required practicum, failure to complete a required internship, failure to comply with professional standards appropriate to the field of study, failure to make satisfactory progress in the academic program, etc.).

When such action is taken, students are notified via email and are provided with the conditions for removal from probation and the circumstances that would lead to disqualification, should probation not be removed.

Administrative Disqualification

A graduate student who has been placed on administrative probation may be disqualified from further attendance in a program by action of the Dean of the college (or the Dean's designate) in which the student is enrolled and in consultation with the Dean of Graduate Education for any of the following reasons:

1. The conditions for removal of administrative probation are not met within the period specified.
2. The student goes on academic probation while on administrative probation.
3. The student is subject to administrative probation for the same or similar reason for which the student has been placed on academic probation previously, although not currently in such status.

When such action is taken, the student is notified via email from the Dean of Graduate Education that includes an explanation of the basis for the action. Disqualification may be either from further registration in the program or from further enrollment at the University as determined by the Dean of Graduate Education.

Dismissal from University

This is an administrative action that prevents students from enrolling at Cal Poly for any future quarters. Dismissal may result from academic

disqualification, administrative disqualification, or from a disciplinary action.

Blended Bachelor's + Master's Programs Overview

Blended programs may provide an accelerated route to a graduate professional degree, with simultaneous conferring of both Bachelor's and Master's degrees. Some blended programs with undergraduate degrees that exceed the 180 unit requirement may allow for the possibility of students' earning graduate credit for several of their senior electives, effectively decreasing the summed unit requirements for both degrees. In addition, blended BS+MS programs may provide an opportunity for students to integrate their senior project more seamlessly with their graduate thesis/project. Students must still complete all undergraduate requirements and must have a minimum total of 225 discrete units between the two degrees.

Blended program students can progress from undergraduate to graduate status with an Approved Admission to Blended Programs form, a Post-baccalaureate Change of Objective form (both forms available through the Graduate Education website), and a verification of successful completion of the GWR; blended program students do not need to apply through the Admissions Office. This eliminates the need to pay the application fee.

Students who are interested in pursuing blended programs should submit a request to the appropriate department head or Graduate Coordinator for all required paperwork. The department head/Graduate Coordinator, with assistance of the Graduate Education Office, determines whether each student meets the eligibility criteria detailed below. Graduate Education performs a final review of the Post-baccalaureate Change of Objective before forwarding the information on to the Office of the Registrar. After the form is processed, students can see their change in status on their Poly Profile.

Eligibility

1. The following are minimum eligibility criteria; *individual departments may have more stringent requirements.*
2. Students must successfully complete a minimum of 180 / maximum 192 undergraduate degree-applicable units (for engineering programs, the maximum number of units is 196). Degree-applicable units are those counted towards the undergraduate degree, and are determined using Expected Academic Progress criteria.
3. Students must be matriculated at graduate standing for a minimum of two quarters before degrees are completed.
4. Students must have a minimum 2.5 GPA in the last 90 quarter units attempted. (*Note that students, once admitted to graduate standing, must maintain a 3.0 GPA or better in courses counting toward the graduate degree.*)
5. Students must complete the Graduation Writing Requirement (GWR) or demonstrate that this requirement was satisfied during their undergraduate program.

Process to Graduate with Both Degrees

1. Students must be matriculated at graduate standing for a minimum of two quarters prior to graduation.
2. Students must submit all required graduate paperwork to the Graduate Education Office and maintain a minimum 3.0 GPA for courses counting toward the completion of the Master's degree.

3. When all requirements are met for both the undergraduate and graduate programs, both degrees will be awarded at the same time and graduation ceremony.
4. If a student fails to complete the MS program requirements, the BS degree may be granted when all requirements for that degree are met. A new Post-baccalaureate Change of Objective is required to transition back to baccalaureate standing before the Bachelor's degree can be conferred.

Second Master's Degree

A student can earn only one Master's degree in any one of the programs offered at Cal Poly. A student who wishes to complete a second Master's degree in another discipline, or two Master's degrees simultaneously, must complete all requirements for both degrees. For students admitted Fall 2017 and after, there will be no double-counting of any units for students who are pursuing a second Master's degree¹. Units taken toward a degree that was never earned either at Cal Poly or elsewhere will not be considered double-counting. Cal Poly's Office of the Registrar will validate if Cal Poly post-baccalaureate/graduate enrollments listed on the Formal Study Plan were not needed to meet any previously awarded master's degree. However, students who want to use post-baccalaureate/graduate enrollment from another institution must provide Cal Poly's Office of the Registrar with an official letter from a regionally accredited institution indicating that the coursework was not needed to meet any master's requirements.

To add a second Cal Poly's Master's degree, a student must complete a Post-baccalaureate Change of Objective form, secure all signatures, and submit the completed form to the Graduate Education office.

¹ This limit does not apply to any programs that have Chancellor's Office preapproved unit reductions such as the Engineering Management (EMP) and MCRP/Transportation degrees.

EXTENDED EDUCATION

Science Bldg. (52), Room E34

Phone: 805.756.2053

extended@calpoly.edu

Vice Provost International, Graduate and Extended Education: Brian Tietje
Marketing Director, International, Graduate and Extended Education: Elaine Sullivan
Director of Operations: Sandra Harris

Cal Poly Extended Education is a self-support unit that works closely with its university, business, community, and international partners to provide access to Cal Poly's unique academic programs and educational resources. We offer a diverse range of degrees, professional development certificates, non-credit courses, youth programs and international education programs. Our primary international education program for incoming short term students is VISIT, visit.calpoly.edu.

Information on programs and current courses is listed on our website at extended.calpoly.edu where online registration is available. An Extended Education catalog of course offerings is mailed periodically to community members.

Academic Credit

These programs are offered on a self-support, special session basis in cooperation with colleges on campus.

Graduate Degrees

Program name	Program type
Accounting	MS
Business Analytics	MS
Dairy Products Technology	MPS
Fire Protection Engineering	MS
Packaging Value Chain	MS
Quantitative Economics	MS
Taxation	MS

Graduate Certificates

Program name	Program type
Fire Protection Engineering Applications	Graduate Certificate
Fire Protection Engineering Science	Graduate Certificate

Open University

This option enables adequately prepared members of the community to enroll in individual Cal Poly courses on a space available basis. Open University is a non-degree registration option. Limits as to the number of credits earned through Open University may apply when seeking admission to a degree program.

Enrollment forms and guidelines for registering may be obtained on the website: openuniversity.calpoly.edu two weeks prior to the beginning of each quarter. To view further details and calendar deadlines, please visit openuniversity.calpoly.edu. Enrollment in Open University is available year round.

Summer Term

Cal Poly Extended Education manages a self-support Summer Term which provides over 400 academic classes to matriculated Cal Poly students and community members. Summer Term is typically scheduled in four sessions: 5-week (2), 8-week, and 10-week.

Quarter Plus

Offered during 4 weeks prior to Fall term, Quarter Plus is an intensive academic program for incoming Cal Poly freshmen. More information on Quarter Plus is available on quarterplus.calpoly.edu.

Professional Advancement

For those desiring to upgrade their skills or knowledge, Extended Education offers a wide range of educational opportunities ranging from professional certificate programs to one-day seminars. These courses may offer academic credit, continuing education units (CEUs), or be offered on a non-credit basis.

Current Professional Certificates

Program name	Program type
Business Analytics	Professional Certificate
Packaging Value Chain	Professional Certificate
FEED (Farmer Experiential Education and Development)	Professional Certificate
Wine Industry	Professional Certificate

Distance Learning

Challenges of time and distance often make it impractical for individuals to travel to campus for classroom-based education opportunities. To address this problem, Extended Education offers many online education programs.

These programs cover a wide range of subjects including applied technology, graphic communications and professional training. A complete listing of programs and courses is available at extended.calpoly.edu.

Corporate and Organizational Training

Extended Education will customize training to meet the specific needs of a business, corporation, or organization. This process starts with a needs assessment and continues through design, implementation and evaluation. Past clients include PG&E, the State of California, and the CA Forest Service.

Community Programs

Extended Education offers a variety of Life and Culture non-credit programs throughout the year, from painting to writing, languages to sausage making. During the year, Extended Education periodically offers day camps for 5-8 grade students.

ACADEMIC SUPPORT AND CAMPUS LIFE

Academic Services and Programs

Academic Advising

Our Vision and Mission

Cal Poly strives to provide effective academic advising in an encouraging and welcoming atmosphere to support students as they navigate their undergraduate academic experience and learn to value their education, in order to foster individual academic success.

Academic Advising at Cal Poly is an on-going, intentional, educational partnership dedicated to student success. Cal Poly is committed to building collaborative relationships and a structure that guides students to discover and pursue life goals, support diverse and equitable educational experiences, advance students' intellectual and cultural development, and teach students to become engaged, self directed learners and competent decision makers.

Which Academic Advisor You Should See

Faculty Advisor

- Advising for major and support courses
- Concentration and elective selection
- Interpretation of courses
- Senior project
- Mentorship
- Internship Opportunities
- Career/graduate school selection

College Professional Advisor

- Academic policy and procedure
- Overall degree requirements/Creating a degree plan
- Students on academic probation and other specific student populations with specific needs
- Referral to appropriate support services

Mustang Success Center Advisor

- General academic advising
- Changing majors
- Understanding online advising/registration tools
- Selecting General Education (GE) courses
- Transfer credit including AP/IB and courses taken at other colleges
- Connecting with appropriate campus resources

How to Maximize Your Advising Experience

- Think through what questions you have and contact the appropriate advisor.
- Take the initiative to meet with your academic advisor regularly and follow through with recommendations.

- When you email faculty or staff members, use your Cal Poly email account (@calpoly.edu) and be sure to sign your name. Be professional. Be sure to clearly explain questions or requests.
- Check your Cal Poly email daily, and reply in a timely manner to all correspondence methods (both email and phone calls).
- Silence your cell phone prior to advising appointments.

What We Expect of You, the Student

You are responsible for fulfilling all the requirements of the curriculum in which you are enrolled. Be an active learner by fully engaging in the advising process. Students share responsibility for a successful university experience and are expected to contribute to effective advising experiences by doing the following:

- Be on time for your scheduled appointments and cancel or reschedule if necessary.
- Be prepared to discuss your goals and educational plans during meetings with advisors.
- Keep and organize personal copies of all important documents relevant to your academic career and progress to degree.
- Become knowledgeable of the university catalog, campus-/college-/major-specific academic policies and procedures, academic calendar deadlines and degree or program requirements.
- Review your Degree Progress Report (DPR) each quarter and seek assistance to resolve any errors or questions in a timely manner.
- Inform an advisor of any concerns, special needs, deficiencies, or barriers that might affect academic success.
- Attend advising appointments and programs.
- Be open and willing to consider advice from advisors, faculty, and other mentors.
- Accept responsibility for your decisions and your actions (or inactions) that affect your educational progress and goals.

What You Can Expect of Your Advisors

Advisors share responsibility for a successful university experience and are expected to contribute to effective advising experiences by doing the following:

- Provide a respectful and confidential environment where you can comfortably discuss academic, career, and personal goals and freely express your concerns.
- Understand and effectively communicate the curriculum, degree/college requirements, graduation requirements, and university policies and procedures.
- Assist you in defining your academic, career, and personal goals, and empower you to create an educational plan that is consistent with those goals.
- Actively listen to your concerns, respect your individual values and choices, and empower you to make informed decisions.
- Serve as an advocate and mentor to promote your success.
- Encourage and support you as you gain the skills and knowledge necessary for success.
- Respond to your questions through meetings, phone calls, or email in a timely manner during regular business hours.
- Collaborate with and refer you to campus resources to enhance your success.
- Maintain confidentiality of your student records and interactions.
- Keep regular office hours and be available to meet with you.

- Participate in evaluating and assessing advising programs and services to better serve you.

Contact Information for College Advising Centers

Contact	Phone #
Agriculture, Food & Environmental Sciences	805.756.7574
Architecture & Environmental Design	805.756.1325
Business	805.756.2601
Engineering	805.756.1461
Liberal Arts	805.756.6200
Science and Mathematics	805.756.2615

Other Academic Advising Services

Contact	Phone #
Academic Skills Center	805.756.1256
Admissions Office	805.756.2311
Athletics Advising	805.756.7041 or 805.756.7043
Disability Resource Center	805.756.1395
Educational Opportunity Program	805.756.2301
Entry Level Mathematics (ELM, MAPE)	805.756.2268
General Education Program	805.756.2228
Graduate Program	805.756.1508
Health Professionals	805.756.2615
Student Academic Services	805.756.2301
Student Support Services	805.756.1395
University Writing & Rhetoric Center (EPT, Early Start English, GWR)	805.756.2067

For more information, a list of advising resources, and an advising handbook, go to <http://www.advising.calpoly.edu/>.

Cal Poly International Center

Cari Moore, Director

Bldg (52), Room E-32
Phone: 805.756.1477
international@calpoly.edu
<http://international.calpoly.edu>

The primary mission of the Cal Poly International Center is to provide leadership and coordination for Cal Poly international activities and to serve as the principal catalyst for internationalization efforts at Cal Poly. The International Center maintains administrative authority and university-wide oversight of international engagement, including international initiatives, programs, and activities supported by the campus. The International Center offers programs and services for both international students studying on campus and students preparing to study abroad. Additionally, the Center supports international travel authorizations for employees traveling on Cal Poly business and for students on non-credit programs.

Cal Poly's vision for internationalization is to provide foundational experiential learning, teaching, service and scholarship opportunities

at home and abroad that will best equip graduates and the campus community at large to solve complex global challenges sustainably, ethically and inclusively. Learn by Doing in a global context drives students, faculty and staff to critically evaluate themselves, their own cultures, their values and place in the world. It promotes growth in character, ability to handle ambiguity, reflexive and relative thinking, and ultimately, greater personal fulfillment. It fuels informed global systems thinkers and doers, and activates Cal Poly students to be positive forces in the world.

International Travel

Phone: 805.756.6118
[intltrlv@calpoly.edu](mailto:intltrvl@calpoly.edu)

All faculty, staff, and students traveling on official university business are required to obtain approval and will be enrolled in the foreign travel insurance program through Cal Poly. All documentation should be submitted prior to travel by the stated deadlines with approval received before travel expenses are incurred. Travel abroad may include activities such as attending or presenting at conferences, participating in tours, conducting funded research, student internships, club activities, or taking students on non-credit international field trips. Please check to see if your destination is deemed high hazardous. In general, student travel to countries listed on the high hazardous lists will not be approved unless the student is accompanied by a Cal Poly faculty or staff member. Students must remain in good academic & disciplinary standing to participate. For deadlines and information on how to complete a travel packet, please go to abroad.calpoly.edu and select *International Travel*. Please note, all Study Abroad program information and registration is a separate process under *Study Abroad*.

International Students and Scholars

[intltservices@calpoly.edu](mailto:intlservices@calpoly.edu)
<http://international.calpoly.edu>

The International Students and Scholars unit of the International Center provides services and programs aimed at meeting the unique needs of international students and scholars throughout their academic careers at Cal Poly. International Center staff provide immigration advising and visa documents, pre-arrival information, arrival orientation, and cross-cultural programming for degree-seeking students and also for non-degree students attending Cal Poly through our Cal Poly International Exchange Programs and the VISIT Cal Poly Program.

The International Center is the first point of contact for departments, areas, centers, and other units that invite to Cal Poly faculty, staff and researchers from international universities to foster collaboration, joint research, and cross-cultural exchange.

The International Welcome Ambassador Program brings international and domestic students together to share their cultures and to develop friendships. Cal Poly International Welcome Ambassadors provide a support system to assist new international students with adapting to Cal Poly and the "SLO Life." In return, the Ambassadors receive invaluable experience learning about life in other countries, make many new friends, and create long-lasting relationships with people from around the globe.

The Cal Poly International Club is open to international and U.S. students interested in making new friends, sharing culture, language, food, and exploring the community together.

Find more information for International Students and International Scholars online.

Study Abroad Programs

studyabroad@calpoly.edu
http://abroad.calpoly.edu

Students interested in studying abroad should begin by visiting the International Center web site, participating in a Study Abroad 101 Workshop, and planning ahead to meet their academic, financial and personal goals. Peer Advisors and Study Abroad Advisors are available to provide guidance. Please check the Cal Poly Abroad website for drop-in advising hours, appointment hours, workshop and info sessions, along with study abroad planning resources.

Study Abroad and Exchange Eligibility Requirements

Students must be in good academic and disciplinary standing at Cal Poly in order to be eligible to participate in study abroad or exchange programs. In addition, students must meet the eligibility requirements of their chosen programs. Academic eligibility standards vary by program and most require a minimum GPA and at least one letter of recommendation. Participants may not study abroad during their first quarter at Cal Poly. Students who are on Academic Probation or Disciplinary Probation at the time of application, or the term prior to studying abroad, must notify the International Center. Normally, such students will be considered ineligible to participate in the program unless extenuating circumstances exist, and the International Center gives its approval. Students are strongly encouraged to seek pre-approval for courses prior to departing for their terms abroad. If a program is located in a country where there is a U.S. Department of State Travel Warning, Cal Poly may not provide the approval to participate in the program, or provide pre-approval for the transfer of credits

Cal Poly Global Programs

Cal Poly Global Programs are study abroad programs that offer students opportunities to study abroad with Cal Poly faculty. Ranging from one week to a full term in length, these programs present a highly flexible model capable of responding to specific curricular goals. Planned with a focus on general education courses and/or courses applicable to one or more Cal Poly major(s) and minor(s), Cal Poly Global Programs may be open to students in all majors or to students in targeted fields of study only. Check our website for the current program offerings.

Cal Poly International Exchange Programs

A number of Cal Poly colleges and departments have individual exchange agreements with a variety of universities around the world. Through these exchanges, students have an opportunity for cost effective, easily arranged study abroad experiences within their own academic disciplines. Students who qualify for one of these exchanges pay Cal Poly tuition fees and applicable fees. Students can spend up to one year at overseas universities as regularly enrolled students.

CSU International Programs

CSU IP participants earn resident academic credit at their home CSU campuses while they pursue full-time study at host universities or study centers abroad for an academic year. The International Programs suite of options serves the needs of students in over 100 designated academic majors. Affiliated with more than 50 recognized universities and institutions of higher education in 18 countries, CSU International

Programs also offers a wide selection of study abroad destinations and learning environments.

Cal Poly Partner Programs

Cal Poly has formal partnership contracts with several private sector and consortium program providers to place Cal Poly students in reputable study programs, usually cooperating universities or specialized study centers. Each partner offers specializations and a variety of locations, and all have been vetted by the Cal Poly International Programs Committee. For further information about partner programs, students should check with the Cal Poly Study Abroad website, visit partner websites, or schedule an appointment as needed with an Affiliated Partner advisor in the International Center.

National Student Exchange (NSE) Consortium

Undergraduate students are able to spend up to one calendar year at another NSE member college or university in the U.S., Canada, and the U.S. Territories (Puerto Rico, Guam, and U.S. Virgin Islands). Since its founding in 1968, more than 115,000 students from all majors nationwide have had the opportunity to study away through the National Student Exchange (NSE). Because students pay in-state tuition and can use their financial aid funds, it is an affordable study away program option.

Intercollegiate Athletics

Mott Athletics Center Bldg. (42), Room 207
Phone: 805.756.2924
Athletic Advising: 805.756.7043 or 805.756.7041

Director of Athletics: Don Oberhelman

Eligibility for competition in intercollegiate athletics is regulated, in general, by the rules of the National Collegiate Athletic Association (NCAA), as well as the University and applicable Conference. The Director of Athletics is responsible for adherence to all eligibility rules. The Faculty Athletic Representative has the responsibility for the interpretation of the NCAA, Conference, and University rules for determining student-athlete eligibility to represent the University in intercollegiate athletic events.

All twenty-one teams compete at the NCAA Division I level.

Cal Poly is committed to providing equal opportunities to men and women students in all campus programs, including intercollegiate athletics.

Library Services

Adriana Popescu, Interim Dean of Library Services
Robert E. Kennedy Library (Bldg 35)
Phone: 805.756.2598 (Hours); 805.756.2029 (Circulation)
lib.calpoly.edu

In 2014 Cal Poly received the Excellence in Academic Libraries Award from the Association of College and Research Libraries (ACRL). The award recognizes Kennedy Library's staff and programs for the delivery of exemplary services and resources that further the educational mission of the institution.

Kennedy Library supports Cal Poly's mission by promoting open and informed inquiry, fostering collaboration and innovation, supporting the

unique needs of every student and scholar at Cal Poly, and contributing to the cultural life of San Luis Obispo.

Kennedy Library selects and delivers quality information in all formats, provides active learning environments, promotes the skills that are needed for student success, and collects and preserves unique collections.

Services

The library offers consultative and instructional services delivered by expert library faculty based in each of Cal Poly's colleges as well as in areas that serve the entire academic community, such as digital scholarship and special collections. In addition, the library provides students with print and electronic access to selected course materials through its course reserves service; and rapid access to books and articles held by other regional libraries through its interlibrary borrowing service. Reference assistance is provided at service desks and via instant messaging. Kennedy Library opens at 7 am on weekdays and is open until 12 am Sunday through Thursday. The 24-hour study space, Hub24, is located on the first floor of the library and is open 24 hours every day throughout the year.

Instruction

Librarians partner with faculty to help students develop research skills relevant to all disciplines. They work with students to ensure they acquire and practice the skills they need to succeed in a complex information environment. This includes finding quality information and using it to communicate skillfully through a variety of media. The librarians and a team of peer-to-peer student assistants teach more than 400 courses each year and provide web-based resources to supplement in-class teaching.

Technology

In partnership with Information Technology Services, the library offers students, faculty, and staff many free services including access to the campus high-speed wireless network, technology available for checkout including laptops, iPads, cameras, camcorders, scanners, and 300 computers with more than 120 software applications. Oversized and specialty (CAD) printing services are also available for a fee from the campus print and copy service located in the library. Student technicians are on staff to help.

Assistive Technology

Kennedy Library provides general-use assistive technology/collaboration stations throughout the building, featuring a range of assistive software applications including screen readers, dual displays and height adjustable tables. Kennedy Library works in close collaboration with the campus Disability Resource Center.

Electronic and Print Resources

Kennedy Library provides access to more than 35,000 electronic scholarly journal titles, as well as to major online indexes and full text databases. These electronic resources are available to Cal Poly students, faculty and staff anytime and anywhere. The library also has a physical collection of more than 500,000 print volumes, and a significant number of other items, including maps, government documents, senior projects and master's theses.

Special Collections and Archives

Established in 1969, Special Collections and Archives makes primary source collections available for public research and customized

instruction sessions. Each year, thousands of items are digitized for easy online access, from organizational records and architectural drawings to oral histories and photographs. Collecting strengths include California architecture, limited edition artists' books, the graphic arts, and regional history. The Julia Morgan Papers, the San Luis Obispo Environmental Archives, and the Central Coast Farm Labor Organizing Collection are just a few featured holdings. The University Archives documents the history, growth and development of Cal Poly, dating from the founding of the university in 1901 to the present. The archives include presidents' papers, campus and student publications, and original content like the Mustang News website and YouTube channel.

DigitalCommons@CalPoly

One of the first and largest institutional repositories in the California State University system, DigitalCommons@CalPoly promotes discovery, research and cross-disciplinary collaboration by collecting, preserving and providing online access to scholarly work created at Cal Poly. DigitalCommons@CalPoly archives faculty research and student scholarship including theses, senior projects, and graduate internship reports. Members of the Cal Poly academic community are invited to contribute completed scholarship for long-term preservation and worldwide access through DigitalCommons@CalPoly.

Data Services

Data Services was started in 2012, and provides specialized guidance in learning complex data analysis and data visualization tools. With dedicated computers, large screen monitors, and GIS and statistics tutors on-site, Data Services provides an ideal environment for students to learn, experiment and develop their skills in analyzing and visualizing data.

Facilities

Kennedy Library offers a variety of seating and study spaces on five floors, with ample natural light and views of the surrounding hills. The library offers 28 study and collaboration spaces, including large collaboration rooms, group study rooms and two dedicated graduate student study rooms; all are equipped with large screen monitors and whiteboards. There are 2 additional collaboration rooms, the One Button Studio and Virtual Meeting Room, which support student presentation preparation and virtual conferencing. The library offers more than 500 seats in a secure and expanded 24-hour study space on the first floor. The library has more than 2000 seats and 300 computer workstations, specialty printing and copying services and a café. The library's atrium features a landscaped patio and shaded seating on four upper balconies. Kennedy Library is visited more than 1.4 million times a year and has been voted "Best Study Spot" by students since 2006.

Events and Exhibits

Kennedy Library offers numerous lively ongoing events and exhibits including: Conversations with Cal Poly Authors, which celebrates books published by Cal Poly faculty; and Data Workshops, a series of talks and events related to data resources and visualization tools. Exhibits are curated in partnership with Cal Poly students and faculty, as well as members of the Cal Poly community, and often feature unique holdings of Special Collections and Archives.

Partners

Kennedy Library is proud to partner with programs that support student learning. Among the partners located in the library are the Academic Programs and Planning; Academic Skills Center; the Center for Teaching, Learning and Technology; Julian's Café and Patisserie; Student Ombuds

Services; Cal Poly Print and Copy; Research Scholars in Residence; and the University Honors Program.

Pre-Health Career Advising

College of Science and Mathematics Advising Center
Bldg. 53, Room 211
Phone: 805.756.2615
prehealth@calpoly.edu
<http://prehealth.calpoly.edu>

Cal Poly State University offers excellent advising and resources for all university students and alumni who are interested in preparing for a career within a health professions field. The College of Science and Mathematics Advising Center is dedicated to mentoring students throughout their college career, helping them to prepare for post-baccalaureate studies in the health professions. Due to the competitive nature of these programs, it is strongly recommended that students plan to seek advice early in their college career to gain an understanding of the components needed to build a competitive applicant profile.

Pre-Health Career Advising

Pre-health career advising is designed to help students explore the health professions as a possible career and enhance a student's competitiveness for admission into a graduate and/or post-baccalaureate program in the health professions. Students should meet with a Pre-Health peer advisor to learn about health career options, required coursework, gaining experience in health care, and other aspects of becoming a competitive candidate. Professional staff provide specific, detailed application advising for students in their application year including personal statement development, interview preparation and more, all targeted at developing the most competitive, well rounded applicants.

Pre-Health Professions Poly Learn Course

The advising center maintains an internal Pre-Health Professions Poly Learn course as a means to share important information about upcoming events, summer internships, research opportunities, visiting guest speakers and informational handouts. Currently enrolled students may request access by sending an email to prehealth@calpoly.edu

Pre-Health Related Courses

Cal Poly offers health-related courses to assist students who are interested in exploring a health professions career. Please see course descriptions below.

SCM 101 Introduction to Health Profession Careers

BIO 253 Health Professions Shadowing

SCM 363 Public Health Fieldwork

Student Academic Services

Hillcrest, Building 81
Phone: 805.756.2301
www.sas.calpoly.edu/

Student Academic Services (SAS) offers comprehensive programs that directly support academic excellence. Program services include academic and personal advising, admissions and transition services,

new student first-year seminars, supplemental workshops and study group assistance. Advising services are focused on students from backgrounds that have been traditionally underrepresented in the California State University System. Academic advisors work with each of the academic colleges to provide academic and personal advising assistance to students with class scheduling, assessment of academic skills, graduation planning, career clarification and related learning and study skills.

The goal of SAS is to ensure that all students have equal opportunity to achieve academic success and graduation. Student Academic Services incorporates the following:

Academic Skills Center

Kennedy Library (35), Room 112
Phone: 805.756.1256
www.sas.calpoly.edu/

The Academic Skills Center (ASC) offers academic enrichment programs (Supplemental Workshops and Study Session) for key content courses in first- and second-year curricula. The goal of Supplemental Workshops and Study Session is to provide a peer-to-peer collaborative learning environment in key content courses whereby students are empowered and encouraged to achieve a deeper sense of learning. Additionally, the ASC provides students with an on-line study skills library and tutor referral resources.

Connections for Academic Success

Bldg 52, Room E23
Phone: 805.756.6774
www.sas.calpoly.edu/

The Connections for Academic Success (CAS) program provides support services to CAS program participants and the University Partners Program, as well as outreach to affinity clubs and organizations in support of transition and retention. CAS was originally established via a joint venture between the University and Cal Poly's student government, ASI (Associated Students, Incorporated). The program offers services to help students plan and achieve their academic and personal goals.

Educational Opportunity Program (EOP)

Hillcrest, Building 81
Phone: 805.756.2301
www.sas.calpoly.edu/

EOP provides admissions and academic support programs for low-income, historically disadvantaged students. EOP offers academic and personal advising, study sessions, academic orientation courses, career and post-graduate advising, and referrals to campus resources.

Educational Talent Search

Hillcrest, Building 81
Phone: 805.756.2301
www.sas.calpoly.edu/

Cal Poly Educational Talent Search (ETS) is a federally funded TRIO program that serves low-income and/or potential first-generation students in grades 7 through 12 in local targeted area schools. The goal of ETS is to assist students to graduate from high school and enter college. ETS offers interactive school site workshops and informational sessions led by program staff, University field trips, parent information

workshops and pre-college advising focused on college entrance requirements and financial aid.

Student Support Services

Student Services Bldg (124), Room 119
Phone: 805.756.1395
www.sas.calpoly.edu/

Student Support Services program, a federally funded TRIO program of the U.S. Department of Education, is designed to assist program participants (low-income, first-generation or disabled college students) with enhancing their academic skills, increasing their retention and graduation rates, and promoting graduate and professional school programs.

Summer Institute

Hillcrest, Building 81
Phone: 805.756.2301
www.sas.calpoly.edu/

Summer Institute (SI) is an academic orientation program held annually for newly-admitted EOP freshmen. Selected SI students have the opportunity to participate in a mini-academic quarter residential program focused on helping to make a successful transition from high school to Cal Poly.

Upward Bound

Hillcrest, Building 81
Phone: 805.756.2301
www.sas.calpoly.edu/

Upward Bound (UB) is a federally funded TRIO program which provides a college preparatory program for low-income and/or potential first-generation college students. This program motivates and academically prepares local target area high school students for college. The academic program and residential summer school session at Cal Poly offer tutoring, career advising and supplemental instruction, as well as cultural and recreational activities.

Testing Services

Student Services (124), Room 121
805.756.1551

Testing Services administers standardized tests of admission, placement and certification, such as the Law School Admission Test (LSAT) and Medical College Admission Test (MCAT), and coordinates the administration of the CSU English Placement (EPT) and Entry Level Math (ELM) test programs. Testing Services also provides general proctoring services for students enrolled in distance learning programs and operates an ETS and Pearson Computer-Based Testing Center that offers such tests as the GRE, TOEFL, CBEST, CSET, and FE.

University Honors Program

Gregg Fiegel, Director
Robert E. Kennedy Library, Bldg. 35, Room 510
Phone: 805.756.7029
<http://honors.calpoly.edu>

Cal Poly founded its University Honors Program in 1999. The mission of the program is to offer an academically enriched learning experience

for Cal Poly's most outstanding and highly motivated students. Serving the entire university, the program provides a supportive and inclusive community for aspiring scholars seeking to challenge themselves, participate in experiential and interdisciplinary learning, serve others, and expand the boundaries of their academic potential.

In support of this mission, the Honors Program provides curricular and co-curricular programming designed to foster intellectual engagement, knowledge discovery, interdisciplinary collaboration, and the mutual exchange of ideas. Courses, seminars, leadership opportunities, research projects, mentoring experiences, service projects, study abroad programs, dedicated meeting/study space, and a learning community in campus housing provide Honors students with opportunities to expand and enrich their academic experiences in the company of similarly motivated peers. Following Cal Poly's hands-on approach to education, students may participate in community projects and co-curricular activities to enhance their coursework, develop leadership skills, gain global perspectives, and build relationships across academic disciplines.

The Honors Program currently supports hundreds of Cal Poly students demonstrating a wide variety of backgrounds, interests, and talents. These students represent nearly 60 different majors in all six colleges on campus. Graduates of the Honors Program leave Cal Poly with a broad and enriched education. In addition, they earn "with Honors" distinction on their diploma and special recognition during commencement.

Students interested in joining the Honors Program should contact the Honors Office in Kennedy Library, Room 510 (Ph: 805-756-7029; E-mail: honors@calpoly.edu) regarding the application procedure and minimum qualifications. Applications are accepted from first-time freshmen, community college transfers, and continuing Cal Poly students who have completed less than five quarters in residence.

Academic Standards

To maintain membership in the Honors Program, students must perform well academically, complete their Honors course requirements in a timely manner, communicate regularly with the program, and maintain good character. The Honors Program reviews each student's academic performance and progress quarterly. A student's Cal Poly (CPSLO) cumulative GPA is used as the primary measure of academic performance. Minimum CPSLO cumulative GPA requirements are as follows:

- 3.3 by the end of the student's first year;
- 3.4 by the end of the student's second year;
- 3.5 by the end of the student's third year; and
- 3.5 by the end of the student's fourth year and at the time of graduation.

Program Learning Objectives

The following Program Learning Objectives (PLOs) define what Honors students will know and be able to do by the time they graduate from Cal Poly and the University Honors Program:

1. Demonstrate attitudes supportive of the Honors Program community;
2. Mentor peers effectively;
3. Communicate effectively with others;
4. Apply leadership principles to organize and direct the efforts of a group
5. Make reasoned decisions based on an understanding of diversity, sustainability, global perspectives, technology, and ethics;

6. Function effectively as a member of an interdisciplinary group or team;
7. Integrate knowledge and skills from different disciplines to solve problems;
8. Plan, carry out, document, and defend a capstone project;
9. Demonstrate skills in information literacy and the ability to self-direct one's learning;
10. Demonstrate a strengthened sense of community, civic responsibility, and philanthropy.

Program Requirements and Curriculum

In addition to the academic standards listed on this page, Honors students must satisfy the program course requirements, complete a senior project or capstone experience within their major, document a campus or community leadership experience, and document a mentor (or learning assistant) experience. Honors students must file leadership and mentor experience documentation prior to their final quarter on campus.

Program course requirements are noted below. Honors students declare a research, study abroad, or community service track during their second year in the program. Students enroll in HNRS 361 to complete their "Honors Track" requirement. Guidelines, conditions, and requirements associated with these tracks are available through the Honors Program office.

REQUIRED COURSES

HNRS 161	Creating Sustainable Communities I	2
HNRS 162	Creating Sustainable Communities II	2
HNRS 163	Creating Sustainable Communities III	2
HNRS 261	Leadership: Self Evaluation	1
HNRS 361	Honors Track - Research, International, and Community Service Experience ¹	1
HNRS 461	Honors Capstone Seminar	1

APPROVED ELECTIVES

Select at least five additional HNRS or HNRC courses	14-20
Total Units	23-29

¹ Complete one of the following Honors Tracks: a research project, a study abroad or international experience, or community service.

University Studies

Academic Programs and Planning

Kennedy Library (35), Room 319

Phone: 805.756.2246

<http://www.academicprograms.calpoly.edu/>

University Studies (UNIV) courses provide an opportunity for interdisciplinary study, addressing university-wide learning objectives (such as diversity, environmental literacy, sustainability, etc.). UNIV courses are offered across college boundaries, typically carrying GE and/or USCP credit. The offerings are subject to available funding.

University Writing & Rhetoric Center

Dawn Janke, Director

Bldg 10, Room 130

Phone: 805.756.2067

www.writingcenter.calpoly.edu

The University Writing & Rhetoric Center is a free service for Cal Poly students, faculty, and staff designed to support writing and writing education across campus. The University Writing & Rhetoric Center offers one-to-one consultations to all Cal Poly students on any writing task. The CSU system-wide Graduation Writing Requirement (GWR) is administered through this office, including the upper-division Writing Proficiency Examination (WPE). The Writing & Rhetoric Center Office also oversees the placement of students into the appropriate first-year writing courses based on the results of their standardized test scores.

Student Resources

Campus Health & Wellbeing

Student Health Center (Bldg. 27)

Campus Health & Wellbeing cultivates student success through timely holistic care and the promotion of lasting wellness. A variety of services are offered for students including ambulatory health care, laboratory testing, onsite X-rays, prescription medications, individual and group mental health counseling, health education programs, and wellbeing resources (financial, career, social, community, and physical/mental health). Campus Health & Wellbeing assists students by minimizing class time lost due to illness, injury, or personal problems. An After-Hours Nurse Advice Line and a Psychological Crisis Line are available at no cost when the Student Health Center is closed. Students may reach the After-Hours Nurse Advice Line by calling the regular Health Center's phone number (805.756.1211). The Psychological Crisis Line may be accessed by calling the regular Counseling Services phone number (805.756.2511).

Health Services

Student Health Center (Bldg. 27)

Phone: 805.756.1211

<http://chw.calpoly.edu>

The following services are available to all enrolled students as part of the Health Services Fee:

- **Outpatient medical services**, year-round, Monday through Friday, 8:00 a.m. to 4:30 p.m. except Wednesday, 9:00 a.m. to 4:30 p.m., including primary medical care, nursing services, men's/women's health care, laboratory testing and routine X-ray procedures.
- **Additional medical services** at a low cost: prescription medication, over-the-counter items, outside laboratory tests, immunizations, and orthopedic supplies.

Health Education

Student Health Center (Bldg. 27)

Phone: 805.756.6181

<http://pulse.calpoly.edu>

Health Education offers evidenced-based prevention education and programming to support the health and wellbeing of students. Led by a team of professional staff, the health education team trains students to be Certified Peer Health Educators in the PULSE Program (Peers Understanding Listening Supporting and Educating). Students can participate in a variety of services such as one-on-one consultations with a peer health educator, 30-minute appointments in the massage chair, or accessing the food pantry for students experiencing financial hardship.

PULSE Peers provide peer-to-peer programming in four main areas:

- Educational Resources On Sexuality (EROS)
- Thoughtful Lifestyle Choices (TLC)
- Health Enrichment Action Team (HEAT)
- Reach-Out, Empower, Accept, Listen (REAL)

Campus Wellbeing

Student Health Center (Bldg. 27)

Phone: 805.756.5442

<http://wellbeing.calpoly.edu>

Campus Wellbeing offers education, resources and programming to support students in achieving a balanced life for success in their personal and professional endeavors. Through the connection of the different life elements – community, financial, physical, social, professional/ career and emotional wellbeing - the program aims to support students in developing essential life skills to prepare for their future endeavors. Campus Wellbeing collaborates with campus and community partners to identify resources and conduct research to offer recommendations regarding best practice for healthy campus communities.

Counseling Services

Student Health Center (Bldg. 27)

Phone: 805.756.2511

<http://counseling.calpoly.edu>

Counseling Services promotes the development of holistic student emotional health. As mental health professionals, the department serves the campus community through advocacy and the provision of confidential, accessible services. Counseling Services helps students develop and maintain the skills integral to mental health through hands-on workshops; individual, couples and group therapy; crisis intervention; consultations with parents, faculty, and staff; and, mental health trainings.

Career Services

Student Services (Building 124)

Phone: 805.756.2501

<http://www.careerservices.calpoly.edu>

The mission of Career Services is to empower Cal Poly students to achieve a lifetime of meaningful career success. Career Services supports students throughout their entire time at Cal Poly.

Career Counseling

Career Counselors assist students with discovering their strengths, interests and personality characteristics, creating dynamic career plans, and building their professional network. Students considering a change of major are encouraged to utilize Career Services so that they become better informed about career options. They will learn how to explore the link between academic majors, their areas of interest and internship, co-op, fellowship, job, and graduate school choices. Through advising, workshops, and interactive experiences, students will develop the skills and strategies needed to achieve their professional goals.

Job Search Exploration

Students are guided through the search process, which includes identifying and researching employers, developing resume/cover letters,

preparing for the interview, and meeting with employers through career fairs, networking sessions and other career-related events.

Various opportunities, on-campus employer interviews, career fairs, and networking events are listed through MustangJOBS, an online platform connecting employers with students. Employers enthusiastically recruit our students for local part-time jobs (on-campus and off-campus), co-ops, internships, summer jobs, fellowships, and career positions (state, regional, and national).

Graduate School Exploration

Career Counselors can assist students with the graduate school admission process, which includes identifying and researching potential graduate programs. Students learn about the process of applying to graduate school, preparing personal statements and completing the necessary requirements for admissions.

Computing at Cal Poly

Bill Britton, Interim CIO, Information Technology Services (ITS)

The Natatorium, Building 46

Phone: 805.756.7000

Email: servicedesk@calpoly.edu

<http://servicedesk.calpoly.edu>

Cal Poly's Information Technology Services (ITS) provides access to a wide range of technology resources to support the success of our students. All students have access to services like free wi-fi, online course materials (PolyLearn), online course planning tools (PolyPlanner), and information about their progress towards degree (PolyProfile). ITS also provides free collaboration tools, including Microsoft Office 365 email, calendar and cloud storage, and a number of other free or discounted software packages.

Equipment like laptops, cameras, and projectors are available for students to check-out from the Media Resource Center, located in Building 2, Room 9 and Building 10, Room 125. To check availability of items or reserve equipment online, go to techrentals.calpoly.edu.

For more information about the technology services and support available on campus, contact the ITS Service Desk.

Dean of Students

Science Building 52, Room E7 (Spring 2017)

Hillcrest Building 81 (Beginning Fall 2017)

Phone: 805.756.0327

www.deanofstudents.calpoly.edu

The Dean of Students Office provides leadership to support student success, strengthen campus community relations, and provide initiatives for future student-centered programs that foster the development of the student academically, socially and ethically.

The Dean of Students supports student learning and service through:

- helping students manage academic and nonacademic situations;
- consulting extensively with faculty and staff on behalf of student concerns;
- interpreting and assisting with understanding campus policies and procedures;
- providing student centers, clubs and organizations to foster a healthy student life;

- cultivating a caring, supportive campus and community environment; and
- assisting with parent concerns regarding campus life and policies.

The Dean of Students Office oversees Cross Cultural Centers, Student Rights & Responsibilities; ; Student Support, Success & Retention; and, Leadership & Service. A variety of services and programs are provided to support, encourage and develop leadership skills, personal development, volunteerism, responsible citizenship, and academic success. The mission of the Dean of Students is to prepare students for participation in a global society.

Individuals with questions or concerns are encouraged to stop by or contact the office. The staff answers questions, advocates when appropriate, investigates student complaints, supports students, and directs students to the appropriate campus or community resource as needed.

Cross Cultural Centers

Gender Equity Center

As a part of the Cross Cultural Centers, the Gender Equity Center (GEC) supports students' exploration of gender. Through the education of current events, stereotypes, and cultural influences, it empowers students to challenge inequity and embrace social justice.

Multicultural Center

As a part of the Cross Cultural Centers, the MultiCultural Center (MCC) supports and advocates for under-represented students by honoring cultural expression, building community, and creating cross-cultural connections.

Pride Center

As a part of the Cross Cultural Centers, the Pride Center supports and advocates for the unique academic and social needs of lesbian, gay, bisexual, trans, queer or questioning, intersex, and asexual (LGBTQIA) students to promote personal growth and success.

Student Rights & Responsibilities

The Office of Student Rights & Responsibilities administers the California State University Standards for Student Conduct. This ensures a fair and impartial administration of the disciplinary process while educating students about their responsibilities and protecting the rights of all members of the University community.

Off-Campus Programs

Off-Campus Programs assists students in living offcampus responsibly. Educational prevention programs are provided to students planning on living offcampus after their first year at Cal Poly. The program also addresses student behaviors that adversely impact neighbors and community members when students receive an alcohol arrest/citation or noise citation off-campus.

Student Support, Success & Retention

Student Support, Success, & Retention is responsible for ensuring students' success by providing support, advocacy, and follow-up services in collaboration with other University departments, individuals, and stakeholders in the students' success. It provides support to academic colleges by working directly with students, faculty and administration on reducing barriers to student success, collaborating with the colleges to

establish meaningful campus support services, and by providing direct, early intervention in problem-solving to ensure retention and graduation.

Safer

Safer is Cal Poly's primary resource for addressing sexual violence, dating violence, domestic violence, and stalking. It provides support through crisis counseling, advocacy, and education.

Veterans Success Center

Cal Poly's Veterans Success Center provides multi-faceted assistance to prospective and enrolled student veterans and dependents.

Leadership & Service Center for Service in Action

The Center for Service in Action at Cal Poly connects students with meaningful volunteer opportunities that complement their educational experience, strengthen their understanding of diversity and social responsibility, and develop skills to become ethical and knowledgeable leaders who contribute to a global society.

Center for Leadership

The Center for Leadership supports the development of student leadership and service on campus and in the surrounding community. Its events and services combine theories of leadership with action-based approaches that aim to better serve our communities and society as a whole. Students are encouraged in their leadership skill development, leadership competency, assumption of leadership and service roles, and the continuation of service to one's community after graduation.

Fraternity & Sorority Life

Fraternity & Sorority Life supports Greek members to become ethical leaders and to fulfill the mission of their organizations. They work to resolve sensitive issues relating to students; recommend training programs for Greek leaders and advisors; assist in prevention and resolution of conflicts between Greek organizations and between the Greek community, campus and community officials; and, serve as the campus representative to national Greek organizations.

Clubs & Organizations

Club Sports Program

The Club Sports Program at Cal Poly provides a form of athletic and educational activity that is an integral part of collegiate life.

Clubs & Independent Student Organizations

Clubs & Independent Student Organizations at Cal Poly provides opportunities that incorporate instruction and service in a "Learn by Doing" environment. The Clubs & Independent Student Organizations' hands-on approach develops leadership skills, enhances social growth, and complements the academic curriculum.

Disability Resource Center

Student Services Building (124), Room 119

Phone: 805.756.1395

www.drc.calpoly.edu

The Disability Resource Center's mission is to cultivate an accessible and inclusive community where students with permanent and temporary disabilities have an equal opportunity to participate in all aspects

of campus life. It facilitates student learning and access through partnerships with students, faculty, and staff.

Students wishing to use disability-related services and accommodations meet with an access specialist to review eligibility. Advance planning is strongly encouraged.

Inclusive Excellence

Bldg. 01, Room 412

Phone: 805.756.6655

<http://www.diversity.calpoly.edu/content/index2>

Developed by the Association of American Colleges & Universities, "Making Excellence Inclusive" is a unifying vision designed to help institutions fully integrate their diversity, equity, and educational quality efforts and embed them into the core of academic mission and institutional operations. Cal Poly's adoption of Inclusive Excellence (IE) in 2009 was supported by resolutions of the Academic Senate and the ASI Board. Activities and programs are described on the IE website.

LSAMP Program

Louis Stokes Alliance for Minority & Underrepresented Student Participation (LSAMP) in STEM Program

Center for Engineering, Science & Mathematics Education (CESAME), Bldg. 25

Phone: 805.756.2875

<http://lsamp.calpoly.edu>

lsamp@calpoly.edu

Faculty Director at Cal Poly: Dr. Jane Lehr

The LSAMP Program is designed to support undergraduate students who face or have faced social, educational and/or economic barriers to careers in science, technology, engineering, and mathematics (STEM) fields. The goal of the LSAMP Program is to increase the persistence and graduation rates of students from underrepresented groups who major in STEM disciplines. To accomplish this goal, the Cal Poly SLO LSAMP Program provides advising, community-building activities, professional development opportunities, and financial assistance to support successful transitions to Cal Poly and to careers in STEM fields. The LSAMP program emphasizes activities designed to enhance graduate school and career preparedness, including undergraduate research experiences, support for community college transfer students in STEM, and opportunities for student participation in academic conferences and international activities. Cal Poly SLO LSAMP is supported by the National Science Foundation (NSF) under Grant No. HRD-1302873 and the CSU Chancellor's Office.

To be eligible for financial assistance, students must face or have faced social, educational and/or economic barriers to careers in STEM; be a U.S. citizen or permanent resident; and be enrolled at Cal Poly in an eligible major. Eligible majors include any major in the College of Engineering or College of Science and Mathematics (excluding Liberal Studies); the following majors are also eligible: Agricultural and Environmental Plant Sciences, Agricultural Business, Agricultural Science, Agricultural Systems Management, Animal Science, Architecture, Architectural Engineering, BioResource and Agricultural Engineering, Construction Management, Dairy Science, Environmental Earth and Soil Sciences, Environmental Management and Protection, Food Science, Forestry and Natural Resources, Industrial Technology, Landscape Architecture, Liberal Arts and Engineering

Studies, Nutrition, and Wine and Viticulture. Students may apply online at <http://lsamp.calpoly.edu/>.

Student Ombuds Services

Patricia Ponce, Student Ombuds

Robert E. Kennedy Library (35), Room 113

Phone: 805.756.1380

<http://ombuds.calpoly.edu>

The Office of Student Ombuds Services provides students with a safe place to seek confidential guidance on university related concerns and complaints. All communications are confidential, informal, and neutral, and will not be disclosed to anyone unless given permission to do so except when required by federal or state law, when there appears to be imminent risk of serious harm to self or others and issues around sexual misconduct. The Ombuds is committed to hearing about students' experiences, assisting them in understanding applicable university policies and procedures, and - as appropriate - helping them to resolve informally any university-related issue. The Ombuds adheres to the Code of Ethics and Standards of Practice of the International Ombudsman Association.

Student Affairs

Office of the Vice President for Student Affairs

Administration Building (01) Room 209

805.756.1521

<http://www.studentaffairs.calpoly.edu/>

Student Affairs delivers innovative co-curricular learning experiences that directly impact student recruitment, retention, and graduation from Cal Poly. The division is committed to the active engagement, wellbeing, inclusion, and success of all students as they progress to graduation and accomplish life-long aspirations. Student Affairs drives graduation initiatives set forth by the CSU and is intrinsically involved in the university's commitment to create a comprehensive, integrated strategy that improves graduation rates and closes the achievement gap for various student populations.

The Office of the Vice President for Student Affairs oversees departments that promote success throughout the Cal Poly experience by providing Learn by Doing opportunities, delivering innovative, student-centered programs, encouraging personal growth, and empowering our students within a safe, healthy, inclusive and supportive environment.

Vision

The vision of Student Affairs is to inspire all students to embrace their unlimited possibilities.

Values

Champion the student

Student Affairs provides comprehensive support, guidance and advocacy to create the environment for all students to reach their full potential.

Create visionary programs and services

Student Affairs serves as a leader in delivering innovative and extraordinary co-curricular learning experiences that directly impact student recruitment, retention and graduation.

Sustain meaningful partnerships and collaboration

Student Affairs partners throughout the campus and local community, building strong relationships through active communication to foster an inclusive environment for student success.

Cultivate continuous learning

Student Affairs matches the quality of Cal Poly's in-class experiences with out-of-class experiences that enhance Learn by Doing.

Promote ethics, integrity and respect

Student Affairs values and celebrates all students, staff, faculty, parents and the extended community with a commitment to employ honest and ethical decision-making practices in all that the division does.

Student Success-Focused Programs and Services

The Office of the Vice President for Student Affairs provides the divisional leadership, support and oversight of the following units: Alumni Relations, Associated Students, Inc. (student government, recreation center and recreation sports, Julian A. McPhee University Union, childcare) Intercollegiate Athletics, Academic Support (orientation programs, academic services, disability resources, testing services), Campus Health and Wellbeing (health services, counseling services, health education, wellbeing), Career Services, Commencement, Dean of Students (clubs and organizations, Greek Life, Safer, leadership, community service, cross cultural centers, student rights and responsibilities, student crisis management, off-campus programs), Parent and Family Programs and University Housing. In addition, the office oversees divisional strategic planning, assessment, marketing, fund development, dining programming, and advocates to community, policy-makers, and the Chancellor's Office for all student engagement and programming outside of the classroom.

Campus Life

Associated Students, Inc.

University Union (65), Room 212
Phone: 805.756.1281
www.asi.calpoly.edu

Mission Statement

The mission of Associated Students, Inc. is to enrich the quality of student life and to complement the educational mission of Cal Poly through shared governance, student employment, student advocacy and a broad spectrum of programming, services and opportunities for leadership and social interaction.

Vision Statement

Connecting students to their ultimate college experience.

About ASI

Associated Students, Inc. (ASI) is an inclusive, empowering, student-driven organization committed to providing programs, services, and facilities that enhance and develop the student learning experience. Cal Poly students are stakeholders in ASI and have access to leadership positions through Student Government and on-campus employment. All of these opportunities are designed to complement Cal Poly's educational mission, support a balanced education, and give students ownership and pride in their college experience.

ASI Student Government

University Union (65), Room 202
Phone: 805.756.1291

ASI Student Government is a combination of elected and volunteer student leaders who act as a representative body for the student community at Cal Poly, working to uphold ASI's vision for the ultimate college experience. Unifying the diverse student community, Student Government acts as the collective voice of students advocating for change, support, and resources to create positive contributions both on and off campus. Through the three branches of ASI's Executive Cabinet, Board of Directors, and University Union Advisory Board, student leaders encourage shared governance, student advocacy, and collaboration with other campus and community entities to ensure student interests are represented at every level. Their consistent and tireless efforts to ensure this influential representation range from the CSU System to the federal level. ASI prides itself on its commitment to developing student leaders.

ASI Programs, Services, and Managed Facilities

The University establishes an operating agreement with ASI to manage the following university facilities: Julian A. McPhee University Union, Orfalea Family and ASI Children's Center, Cal Poly Recreation Center, and Cal Poly Sports Complex.

Julian A. McPhee University Union (UU)

The Julian A. McPhee University Union is the gathering place for the Cal Poly community. Commonly referred to as the UU and its surrounding outdoor area as the UU Plaza, it acts as the center for campus activities. The UU is home to the majority of ASI programs including ASI Events, ASI Club Services, the ASI Craft Center, ASI Student Government, and ASI Business Services, in addition to the Chumash Auditorium, Chandler Lounge, numerous university organizations, and eating establishments. It is fashioned with a variety of seating areas, computer kiosks, charging stations, Wi-Fi, sound, hydration stations, and digital TV displays for advertising and up-to-the-minute news or sports coverage. Conference rooms, the Chumash Auditorium, lounges, and the UU Plaza are available for reservation to hold meetings, conferences, or events.

ASI Business Office

University Union (65), Room 212
Phone: 805.756.1281

The ASI Business Office is located within the UU and is the operational location for numerous internal services including Human Resources, Information Technology, General Corporate Administration, and Accounting. This is the hub that supports all programs and services of ASI.

ASI employment and job recruitment is managed through the ASI Business Office. Employment positions with ASI allow students the opportunity to work on campus while gaining valuable work experience and development skills with an organization that gives priority to their studies. Over 75 full-time and part-time career employees are also employed by ASI. ASI employees are the driving force behind creating quality programs and services that support the organization's vision and the students of Cal Poly.

UU Epicenter

University Union (65), Room 203

The UU Epicenter is a one-stop shop where students can obtain information, materials and resources on the following ASI programs

and services: ASI Events, ASI Craft Center, Facility Reservations, Event Management, Audio Visual Services, Public Relations and Marketing, ASI Graphics, and UU Building Services.

ASI Club Services

University Union (65), Room 203
Phone: 805.756.5807

With over 300 student organizations available at Cal Poly, students have access to get involved and expand their personal skills and development with other individuals of similar interests. ASI Club Services connects students to these clubs and organizations, working as a partner with the University to administer day-to-day club operations. Getting involved with a student club or organization connects students socially with others, enhancing their overall college experience and campus network. Whether it is joining an organization with similar cultural, community, or recreational interests, or starting a new club—ASI can help.

ASI Events

University Union (65), Room 203
Phone: 805.756.1112

Delivering the ultimate college experience is more than just helping students excel through studying and attending classes—it is about getting out of the classroom, being social, and having fun! ASI Events provides opportunities for amusement and entertainment to campus. From concerts to comedians, Stress-Free Studies to Mustang Mile, ASI Events creates a variety of fun activities and social opportunities for Cal Poly students to enjoy at little to no cost—planned by students, for the students.

ASI Craft Center

University Union (65), Room 111
Phone: 805.756.1266

Create, design, relax, and restore in the ASI Craft Center. This unique environment located in the University Union offers seven well-equipped studios and a plethora of student-led classes for all skill levels to explore. The space is open to the Cal Poly community and off-campus communities to work in a class or independently with hands-on projects from ceramics to surfboard shaping.

Poly Escapes

Cal Poly Recreation Center (43)
Phone: 805.756.1287

Limitless adventure awaits with ASI Poly Escapes. Located at the Cal Poly Recreation Center, ASI Poly Escapes boasts an outdoor climbing park available to all skill levels from beginner to the seasoned pro, equipment rentals at low-cost fees for the Cal Poly community from tents to kayaks, and guided one-day to week-long trips throughout San Luis Obispo County and California. From ocean sports to mountain exploration, students have the opportunity to break away from the day-to-day.

Cal Poly Rose Float

Phone: 805.756.1268

The students of Cal Poly Universities in San Luis Obispo and Pomona work together each year creating the only student-built float that cruises down Colorado Boulevard in Pasadena, California as part of the Tournament of Roses Parade held annually on New Year's Day. The University's "Learn by Doing" motto is exemplified in all facets of the

program, as students get hands-on experience turning their concepts into creations.

Cal Poly Recreation Center

Cal Poly Recreation Center (43)
Phone: 805.756.1366 Main

The Cal Poly Recreation Center is a cutting-edge facility managed by ASI that offers multiple workout rooms, state-of-the-art equipment, an indoor track, numerous indoor courts, a variety of group fitness classes, personal training, an Olympic-size lap pool, leisure pool, beach volleyball courts, recreation areas, and relaxation zones—all available to eligible members of the Cal Poly community. ASI recreation and safety programs are provided within this facility commonly referred to as The Rec Center.

Recreational Sports Programs

Aquatics classes are for all levels of swimmers, from beginning to masters. The Recreation Center provides members with an aquatics facility complete with an Olympic-size lap pool and heated leisure pool areas. Swim instruction, group exercise, safety certifications, scuba certification and pool deck relaxation are all available at the Recreation Center.

Personal Training provides the opportunity to get fit with nationally certified personal trainers in a fun, safe environment. Individuals learn how to work out and use equipment properly from personal trainers who provide personalized attention for each client. All Recreation Center members can participate in a free personal training session which includes an introduction to facility equipment and a customized workout designed to help members reach their fitness goals.

Group Exercise classes represent discipline areas of mind and body, cardio, strength, tone, and cross-training, available each quarter with indoor and outdoor class offerings. Up to 80 fitness classes are available per week including breakaway indoor cycling, Zumba, multiple forms of yoga, Pilates, BodyCombat, BodyPump, Barre Connect, and more.

Fitness and Specialized Class programs are designed for individuals to acquire new skills in a relaxed and enjoyable setting. Classes include, belly dancing, TRX, Muay Thai, Krav Maga, Shorin Ryu Karate, and more.

Informal Recreation provides non-structured opportunities to participate in a variety of activities such as swimming, cardiovascular exercise, free weight and weight machines, basketball, volleyball and racquetball.

Intramural Sports are a popular choice for many students, offering a variety of indoor and outdoor team sports, leagues, and tournaments to keep participants in the game all quarter long. Students and Cal Poly Recreation Center members are able to create their own teams or register as free agents for dozens of organized sporting events offered year-round.

Orfalea Family and ASI Children's Center

Orfalea Family and ASI Children's Center (133)
Phone: 805.756.1267

The Orfalea Family and ASI Children's Center is a nationally accredited program providing quality early care and education services to children four months to six years. This program provides a learning environment where children are encouraged to explore ideas and interests through detailed project work. The project approach is a comprehensive curriculum incorporated into all classrooms, focusing on the children's interests, ideas, and discoveries. Cal Poly student parents have first

priority for enrollment. Cal Poly Faculty and Staff receive second priority for enrollment, followed by Cal Poly alumni and community members.

Cal Poly Sports Complex

The Cal Poly Sports Complex refers to the more than 40 acres of outdoor, lighted playing fields primarily used for student recreational sports programs, intercollegiate athletics, and outdoor club activities. These spaces include five basketball courts, four soccer fields, three softball fields, and three artificial turf fields. Lower fields include a NCAA regulation baseball stadium and softball stadium.

Cal Poly Corporation

Corporation Administration Bldg. (15)
Phone: 805.756.1131

The Cal Poly Corporation is a separate non-profit §501(c)(3) organization serving the university across several key support functions:

- Commercial Operations – Campus Dining, University Store, Cal Poly Downtown, Cal Poly Print & Copy, Conference and Event Planning, Commercial Licensure, and Alcohol Licensure
- Financial & Support Services – Post-award sponsored projects, centers and institutes, Aid-to-Instruction Programs, Swanton Pacific Ranch, Technology Park, ASI, Performing Arts Center, Cal Poly Arts, Bella Montana faculty-staff housing, administration of gifts, holding, usage and liquidation of real property & gifts-in-kind, administration of special activity accounts, and funding advances or guarantees for projects

A Board of Directors comprising of students, faculty, community leaders and university administrators oversees Cal Poly Corporation operations.

New Student & Transition Programs

Science Bldg. (52), Rooms E8-10
805.756.2400
orientation@calpoly.edu
orientation.calpoly.edu

The first step for newly-admitted students and their families begins at Orientation, first with a campus visit to preview the campus during the Spring quarter. Summer Orientation provides the next steps with an introduction to Cal Poly and its world-renowned academic programs, extensive services, and rich traditions.

New Student and Transition Programs offers several program throughout the summer and academic year to support new students as they enter and transition into Cal Poly:

- Summer Orientation Sessions – for all incoming first-year and transfer students
- Parent & Supporter Orientation – for the parents and family members of new students
- Week of Welcome – a Fall Quarter program for advising and enrollment support

Cal Poly Open House

Cal Poly Open House is an annual, three-day event that showcases the campus to admitted and current students, their supporters, alumni, and the San Luis Obispo community. Stemming from Poly Royal, Open House

began in 1994 and has since included programs such as the University welcome, college welcomes, Friday Nite Invite, and many more fun activities. This event takes place in April each year. Cal Poly's Admitted Students' Preview Day (during Open House weekend) is when admitted students and their supporters have an opportunity to preview the campus and connect with its leaders. There are presentations, tours and event opportunities to meet the college deans, faculty, and current students and hear from President Jeffrey D. Armstrong about the many resources and programs available to Cal Poly students.

Student Life Orientation (SLO) Days

Student Life Orientation (SLO) Days is a summer orientation program for all incoming students, parents, and supporters. This Summer Orientation introduces students and supporters to the University through campus tours, information sessions from our many campus offices, student and parent panels, and presentations from Cal Poly's administrators. "The Mustang Way" and "Learn by Doing" mottos are integrated throughout the student and supporter sessions to provide a true Cal Poly experience. SLO Days collaborates with off-campus and downtown businesses to offer a San Luis Obispo welcome to attendees through its "Explore SLO" downtown tours.

Week of Welcome (WOW)

Week of Welcome (WOW), recognized as one of the nation's largest university orientation programs, integrates thousands of new students to campus and community life during their first week before classes begin in the Fall. Over 900 student WOW Leaders volunteer their time to educate new students about campus and community life, educational resources, and valuable services and programs that will help them have successful and fulfilling experiences at Cal Poly.

Student participation in both SLO Days and WOW is mandatory for incoming freshmen.

Parent and Family Programs

Hillcrest (81)
Parent Helpline: 805.756.6700
Email: calpolyparent@calpoly.edu
www.parent.calpoly.edu

Parent and Family Programs provides support, resources and exciting programming for the proud parents, family members and supporters of Cal Poly students. The program is designed to enhance student success and increase parent engagement. Additionally, the program offers a robust communication platform, increases parents' and supporters' awareness of University resources, and helps parents develop strategies to meet the unique challenges of parenting students throughout the college years.

Staff can be reached via email and the program's helpline. Parent and supporter information and resources are provided on the Parent and Family Programs website, social media, and through regular email communications.

Parent and Family Programs hosts welcome receptions for families throughout the year, including orientation and move-in events. The program oversees the Parent Advisory Council and the Cal Poly Proud Parent Volunteer Corps, and hosts the annual Mustang Family Weekend.

Sustainability Practices

Climate change poses challenges to society unseen in human history. We are at a crossroads in which the disciplines of business, politics, public policy and technology must collaborate to drive innovation and implement real solutions. As a comprehensive polytechnic university, Cal Poly is uniquely positioned to educate and inspire the next generation of leaders, innovators, and decision makers who will confront this challenge. That is why I chose to commit Cal Poly to achieve net zero greenhouse gas emissions by 2050 and integrate these efforts into curriculum, research, and student experience through Learn by Doing. Our children and grandchildren deserve no less. – Jeffrey D. Armstrong President Cal Poly San Luis Obispo, California

In March 2016, Cal Poly adopted the AASHE (Association for the Advancement of Sustainability in Higher Education) STARS (Sustainability Tracking, Assessment, and Rating System) as a framework for implementation, measurement, and improvement of sustainable practices across the entire university. The data collection and certification process finalized in February of 2017 earned Cal Poly a silver rating. The full report appears online:

<https://stars.aashe.org/institutions/california-polytechnic-state-university-ca/report/2017-02-16/>. The voluntary point-based rating system measures sustainability performance in the categories of Curriculum and Research, Campus and Community Engagement, Operations, and Planning and Administration further detailed below:

Please see University Policies (p. 8) for Cal Poly's Statement on Sustainability.

Curriculum and Research

Cal Poly seeks to **educate for environmentally responsible citizenship**. Literacy in sustainability begins with a student's first on-campus experience through presentations and modeled sustainable activities such as zero waste meals. Students may elect to fulfill general education and major requirements by enrolling in sustainability courses. See <http://suscat.calpoly.edu/>. Students wishing to specialize in various aspects of sustainability may choose from more than a dozen minors.

In 2009, the Academic Senate proposed and the University accepted the addition of Sustainability Learning Objectives to Cal Poly's University Learning Objectives. As a result, all faculty members are encouraged to systematically incorporate sustainability into their courses. Please see <http://ulo.calpoly.edu/>.

In 2010, the University formally recognized the CAFES Center for Sustainability, which started as a student-led program in 2000. The Center helped establish the Cal Poly Organic Farm, numerous professional development programs in sustainable pest management, composting, artisan foods and, most recently, the FEED (Farmer Experiential Education and Development) program for veterans entering agriculture. The Center has hosted many of the leaders of the sustainable agriculture movement at Cal Poly and has offered scores of public education programs on organic gardening, permaculture, holistic management, fair trade, bee keeping, carbon farming, and more. The Center also facilitates campus-community collaborations, which have resulted in regional food system initiatives, buy local campaigns, and young farmer coalitions. Please see <http://sarc.calpoly.edu/>.

From 2011-2015, the self-organized SUSTAIN (Sino-US Strategic Alliance for Innovation) learning initiative involved over 200 freshmen and 50 different majors in over 40 community projects organized around sustainability; this effort linked courses from 16 different faculty

collaborators across five of Cal Poly's six academic colleges and 24 different community partners. Begun in 2008 by a Cal Poly team with faculty from Tongji University and Stanford University, the SUSTAIN institute committed to learning to innovate for sustainable design in China and San Luis Obispo. Please see <https://sustainslo.calpoly.edu/>.

In 2015, the College of Architecture and Environmental Design's 25+ year-old interdisciplinary Sustainable Environments Minor program, completed by approximately 80 students/year from every college on the campus, won a UC/CSU/CCC Energy Efficiency and Sustainability Best Practice Award for Sustainability in Academics. This same program received the top national American Institute of Architects award in 2005 for "Ecological Literacy in Architectural Education."

Campus and Community Engagement

The Empower Poly Coalition serves as the center for student engagement and unifies the voice of over two dozen sustainability-related clubs and groups on campus.

Cal Poly's STRIDE Program has worked with schools and government agencies to design and assess novel, comprehensive community-based education and intervention programs for promoting healthy living.

Cal Poly's iRideshare, Bike to Work, and Bike to School Day programs match carpool groups, track modes of travel documented, and incentivize using active transportation.

Operations

For Earth Day 2016, President Armstrong signed the Second Nature Climate Leadership Commitment, making Cal Poly a Charter Signatory to the largest climate change initiative in higher education. Participating campuses must create Climate Action Plans to achieve carbon neutrality and climate resilience as soon as possible and infuse these topics into curriculum, research, and student experience. Cal Poly has established a goal of net zero emissions by 2050 and is working with regional partners to ensure campus resiliency to impacts from climate change. To achieve these goals, Facilities Management and Development and the City and Regional Planning Department collaborated to create Cal Poly's first Climate Action Plan (CAP). The CAP included a comprehensive greenhouse gas inventory, which shows Cal Poly has already reduced emissions to within ten percent of 1990 levels, despite a 100 percent increase in building square footage and on-campus residency. The Poly CAP report, transportation survey, and GHG dashboard appears online: https://afd.calpoly.edu/sustainability/campus_resources/climate_action.

Cal Poly practices institutional ecology and has taken significant steps to reduce its environmental footprint. In 2013, classes began in the Warren J. Baker Center for Science and Mathematics, a 189,000 square-foot building embodying sustainability principles. In 2009, Cal Poly opened Poly Canyon Village a 1.4-million-square-foot mixed-use complex, which provides apartment-style housing for over 2,600 students – the largest LEED Gold project in the region and in the CSU. LEED certification is being achieved in all new buildings as well as selected retrofits. In 2017, Cal Poly broke ground on the 4.5 MW Gold Tree Solar Farm.

The College of Agriculture, Food and Environmental Sciences (CAFES) operates state-of-the-art instructional facilities on 10,000 acres and incorporates sustainability principles into its operations in the form of water, energy and soil conservation, and through integrated farm, ranch and vineyard management. Notable features include a CCOF certified organic farm, a large-scale composting facility, holistically-managed

pastures, fair trade chocolates, and award-winning certified-sustainable forests.

Cal Poly has received more than two dozen UC/CSU/CCC Energy Efficiency and Sustainability Best Practice Awards. Recent awards honored the HVAC Retrofit (2016), Water Efficiency and Site Water Quality (2015), Sustainability Innovations (2015), and Sustainability in Academics (2015). In 2010, the National Wildlife Federation's "National Report Card on Sustainability in Higher Education" rated Cal Poly as "Leading School for Environmental Sustainability Goal Setting" and "Leading Employer of Environmental Management and Sustainable Professionals."

Planning and Administration

In May 2014, the CSU Board of Trustees, adopted the first CSU system-wide Sustainability Policy. The policy further reduces the environmental impact of construction and operation of buildings and integrates sustainability across the curriculum. Our polytechnic, hands-on, Learn-by-Doing approach uniquely qualifies Cal Poly to educate the future leaders, problem solvers, and decision makers to confront the effects of climate change. The CSU Sustainability Policy established goals to:

- Reduce greenhouse gas emissions to 1990 levels by 2020
- Reduce greenhouse gas emissions 80 percent below 1990 levels by 2040
- Procure 33 percent of energy supply from renewable sources by 2020
- Increase on-site energy generation from 44 to 80 MW by 2020
- Reduce per-capita landfill waste 50 percent by 2016 and 80 percent by 2020
- Reduce water use 10 percent by 2016 and 20 percent by 2020

Cal Poly signed the Talloires Declaration in April 2004. This 10-point action plan formalized Cal Poly's commitment to sustainability and environmental literacy in teaching, theory, and practice. Through the combined work of the President's Sustainability Advisory Committee (http://www.academicsenate.calpoly.edu/content/university_comm/sustainability_advisory), the Academic Senate's Sustainability Committee (http://www.academicsenate.calpoly.edu/content/acadsen_comm/sustainability), and the numerous faculty, staff and students involved with sustainability, the University's commitment to sustainability grows at all levels. For more information, please see <http://sustainability.calpoly.edu/>.

University Housing

Building 31
Phone: 805.756.1226
<http://www.housing.calpoly.edu/>

University Housing provides an inclusive living experience for all Cal Poly students. Engaging residential life programs, led by professional staff and peer leaders in diverse Learning Communities, provide a foundational experience rooted in the Mustang Way that supports Learn by Doing, encourages excellence, and promotes student success.

Because students who live on campus have greater success in college, Cal Poly requires all freshman students to live on campus.* University Housing also offers campus housing to continuing, transfer and graduate students. All campus residents have access to academic, social, wellness and awareness events, enjoy opportunities to build life-long friendships and typically achieve better grades than those who live off campus.

*Freshmen who do not intend to live on campus may request an exemption. Exemptions from the residential requirement are considered based upon the Freshman On-Campus Living Exemption Policy.

Learning Communities

In addition to our beautiful campus and Learn by Doing instruction, Cal Poly offers a strong sense of community. Every campus resident is part of a residential Learning Community. The 2017-18 Learning Communities are:

Living Learning Program

Students live with peers who share their academic college, and connect with faculty, academic advisors and other resources to support their first-year experience.

Connections Themes

Students choose from a wide variety of academically-themed communities and live with other students from various majors who share similar interests.

iCommunity

Students engage in Learn by Doing and collaborate with other young entrepreneurs to springboard ideas into action. They can explore a start-up idea or be part of a team to support a new innovation, business or concept come to life.

Transitions Program

Transitions residents live independently in an apartment community. They explore their personal strengths through the StrengthsQuest program and connect with academic and career advising resources.

Sophomore, Transfer & Continuing Student Success Program

Programs are focused on boosting academic and career success by supporting students in taking advantage of valuable campus partner connections and making life-long friendships.

iCommunity 2.0

Residents live with entrepreneurs, creators and visionaries across all majors to cultivate an innovative mindset. The focus is on preparing to become emerging leaders and career-ready entrepreneurs who are ready to generate innovative solutions to real-world problems, research promising technologies and develop viable business plans.

Cal Poly Lofts

Cal Poly Lofts, located in downtown San Luis Obispo, is for continuing students who have an entrepreneurial perspective and are ready to launch innovations or business ideas. Programs are offered in close collaboration with the Cal Poly Center for Innovation & Entrepreneurship.

Residential Life Staff

Learning Community programs and activities are administered by Coordinators of Student Development –full-time, live-in professionals who assist residents with counseling, crisis intervention, general referrals, and conduct actions. The Coordinators of Student Development also oversee front desk services and the Resident Advisors (RAs). RAs are typically upper-division students who understand the challenges faced by new students and make living on campus a positive and memorable experience. They are trained in building community, making academic referrals, planning events, mediation and crisis intervention.

Student Leadership

Student representatives are elected in fall term to serve on governing boards in each of the halls and apartments. Participants contribute to their hall's community by planning social, recreational, and educational

events, and by voicing student-related concerns. Networks in community services, recreational sports and multicultural issues provide additional opportunities for student involvement.

ResNet

Cal Poly ResNet is the campus housing network. All campus rooms have 24/7 access to the Cal Poly Network and wireless Internet service. University Housing's ResNet Office provides computing support programs for all campus residents.

Securing Campus Housing

New students

Only students who accept Cal Poly's offer of admission are able to apply for campus housing. To secure a space for freshman or transfer student housing, students must complete the following steps on the Cal Poly Portal:

1. Accept the offer of admission from Cal Poly.
2. Apply online through the Housing tab & agree to the terms & conditions.
3. Pay or indicate Financial Aid for the initial payment.

Housing preferences are assigned on a first-come, first-served basis, based upon the date the student secured housing (by completing all of the steps above), demand, and availability.

Continuing students

To secure a space for continuing student housing, students must complete the following steps on the Cal Poly Portal:

1. Apply online through the Housing tab & agree to the terms & conditions.
2. Pay or indicate Financial Aid for the initial payment.

For complete application information, visit the "Housing & Fees" pages on the University Housing website.

Fees

The initial payment, required to secure housing, is the first step in the payment process. A non-refundable initial payment may be required for continuing and transfer student applications. Students can pay the initial payment, or indicate on the housing application that it will be paid by financial aid, provided they expect to receive sufficient aid to cover tuition, housing and dining fees. The balance of fees for the academic year are paid in advance, either in full, by installment payment plan, or by quarterly financial aid disbursements.

Location	Price
Freshman residence halls: double occupancy:	\$7,792
Required freshman dining plan, residence halls:	\$5,323

Location	Price
Freshman apartments, private rooms:	\$9,014
Required freshman dining plan, apartments:	\$4,259

*University Housing also offers triple rooms in the residence halls and shared and double suite bedrooms in campus apartments. These room types are less expensive.

Off-Campus Housing Resources

University Housing publishes the "Educated Renters' Guide" to support students with the transition to off-campus housing. As well, the University Housing (<http://www.housing.calpoly.edu>) webpage includes a link to off-campus housing resources.

University Police

Building 36

Administration: 805.756.6652

Dispatch: 805.756.2281

www.Police.calpoly.edu

Cal Poly's Police Department is a full service police agency certified by the California Department of Justice. It has the same responsibilities and authorities as any other law enforcement agency in the State of California and has state-wide authority. It includes a **9-1-1 emergency dispatch center** that is responsible for all phones, radio communications, emergency medical dispatch, alarm monitoring and dispatch, and all communications for events. **Parking**, a major function of the University Police, includes the management of 8,866 parking spaces, three parking structures, parking and event planning and traffic flow. Special Events management staff is responsible for the traffic and parking coordination of over 500 campus events a year which brings approximately 700,000 visitors to campus.

Commuter and Access Services provide resources for alternative transportation in partnership with local transit, regional RideShare, and bicycle organizations. The Escort Van Service provides free transportation for students, faculty and staff on campus and close vicinity of Cal Poly during evening hours.

FACULTY AND STAFF

Office of the President

Title	Name
President	Jeffrey D. Armstrong
Chief of Staff	Jessica Darin
Chief Communications Officer	Chris Murphy
Executive Assistant	Monica Molina
Ombuds	Patricia Ponce
University Legal Counsel	Dawn Theodora

Academic Affairs

Title	Name
Provost and Executive Vice President	Kathleen Enz Finken
Senior Vice Provost for Academic Programs and Planning	Mary Pedersen
Vice Provost for International Education, Graduate, & Extended Education	Brian C. Tietje
Vice Provost for Research & Economic Development	Bradford Anderson
Dean of Research	Dean Wendt
Vice Provost for Academic Personnel	Albert A. Liddicoat
Assistant Vice Provost for Academic Employee Relations	Tera Bisbee
Associate Vice Provost for Marketing and Enrollment Development	James L. Maraviglia
Registrar, Office of the Registrar	Cem Sunata
Assistant Vice Provost for University Advising	Beth Merritt Miller
Assistant to Provost for Academic Facilities	Charlie Crabb
Vice President and Chief Diversity Officer	Jozi De Leon

Colleges

Title	Name
College of Agriculture, Food and Environmental Sciences, Dean	Andy Thulin
College of Architecture and Environmental Design, Dean	Christine Theodoropoulos
Orfalea College of Business, Dean	Scott Dawson
College of Engineering, Dean	Amy Fleischer
College of Liberal Arts, Interim Dean	Kathryn Rummell
College of Science and Mathematics, Dean	Vacant

Administration and Finance

Title	Name
Senior Vice President for Administration and Finance	Cynthia Vizcaino Villa

Associate Vice President for Commercial Services	Lorlie Leetham
Associate Vice President for Administration and Finance	Victor Brancart

Student Affairs

Title	Name
Vice President for Student Affairs	Keith B. Humphrey
Associate Vice President	Clare O'Brien
Assistant Vice President and Dean of Students	Kathleen McMahon
Assistant Vice President and Executive Director of University Housing	Jo Campbell
Assistant Vice President for Student Affairs	Debi Hill
Assistant Vice President for Alumni Outreach	Ellen Cohune
Executive Director of Campus Health & Wellbeing	David Harris
Executive Director of Associated Students, Inc.	Marcy Maloney
Director of Athletics	Don Oberhelman
Director of Operations	Joette Eisengart
Diversity and Inclusion Officer	Jamie Patton

University Development

Title	Name
Assistant Vice President, Planned Giving	Stacy Cannon
Associate Vice President & Senior Director of Special Gifts	Adam Jarman
Chief Operating Officer	David Dobis

Auxiliary Organizations

Associated Students, Inc.

Title	Name
Executive Director	Marcy Maloney

Cal Poly Corporation

Title	Name
Executive Director	Lorlie Leetham
Director Emeritus	Al Amaral
Interim Associate Executive Director, Administration and Legal Affairs	Will Marchese
Associate Executive Director, Finance and Business Operations	Vacant

Cal Poly Chief Executive Officers

Cal Poly has been guided by the following chief executive officers.

Name	Year
Leroy Anderson	1902 to 1908
Leroy Burns Smith	1908 to 1914

Robert W. Ryder	1914 to 1921
Nicholas Ricciardi	1921 to 1924
Margaret Chase (acting)	1924
Benjamin Ray Crandall	1924 to 1933
Julian A. McPhee	1933 to 1966
Dale W. Andrews (acting)	1966 to 1967
Robert E. Kennedy	1967 to 1979
Dale W. Andrews (acting)	1979
Warren J. Baker	1979 to 2010
Robert B. Glidden (Interim)	2010 to 2011
Jeffrey D. Armstrong	2011 to Present

The faculty and staff, who have served at least fifteen years of full-time meritorious service at Cal Poly, are awarded emeritus status. A complete list of faculty emeriti is available at: www.academic-personnel.calpoly.edu/QuickLinks.html. Contact Human Resources for information regarding staff emeriti. The University appreciates its emeriti members' contributions to the Cal Poly community.

Distinguished Teaching Award Recipients

In 1963 the University instituted a program of recognizing outstanding teaching efforts through the Distinguished Teaching Awards. Selections for this honor are based upon recommendations of the Academic Senate committee which follows the procedure of soliciting nominations from students and colleagues. Evaluations and recommendations of the nominees are based upon an in-depth review by the committee, including classroom visitations. Recipients of the Distinguished Teaching Awards and their departments are listed below.

1963–64	Robert E. Holmquist, Physics John L. Merriam, Agricultural Engineering	Barton C. Olsen, History Ronald L. Ritschard, Biological Sciences Joseph N. Weatherby, Political Science (Social Sciences)
1964–65	Joy O. Richardson, Mechanical Engineering Milo E. Whitson, Mathematics	1972–73 Lyle G. McNeal, Animal Science Charles W. Quinlan, Architecture James E. Simmons, English
1965–66	A. Norman Cruikshanks, Social Sciences Richard F. Johnson, Animal Husbandry George R. Mach, Mathematics	1973–74 William J. Phaklides, Engineering Technology Louis D. Pippin, Education Duane O. Seaberg, Agricultural Management
1966–67	Robert W. Adamson, Mechanical Engineering Kenneth G. Fuller, Mathematics William D. Curtis, Psychology	1974–75 Peter Jankay, Biological Sciences Josephine S. Stearns, Child Development George J. Suchand, Social Sciences
1967–68	Rodney G. Keif, Environmental Engineering David M. Grant, English Wesley S. Ward, Architecture	1975–76 James Hayes, Journalism William V. Johnson, Music Erna Knapp, Art
1968–69	Robert M. Johnson, Mechanical Engineering Bruce Kennelly, Chemistry Alice E. Roberts, Education	1976–77 Harry L. Fierstine, Biological Sciences Grant D. Venerable II, Chemistry Ralph M. Warten, Mathematics
1969–70	Donald W. Hensel, History David H. Montgomery, Biological Sciences Philip H. Overmeyer, Business Administration Willard M. Pederson, English Omer K. Whipple, Chemistry	1977–78 Timothy M. Barnes, History Donald P. Grant, Architecture and Environmental Design John C. Syer, Political Science
1970–71	Robert L. Cleath, Speech Kenneth E. Schwartz, Architecture Hewitt G. Wight, Chemistry	1978–79 Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics
1971–72	Stuart E. Larsen, Aeronautical Engineering	1979–80 David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture
		1980–81 Sarah E. Burroughs, Food Science and Nutrition (Child Development and Home Economics) Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy
		1981–82 Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences
		1982–83 James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering
		1983–84 Euel W. Kennedy, Mathematics William L. Preston, Social Sciences Michael J. Wenzl, English
		1984–85 Robert S. Cichowski, Chemistry Harvey C. Greenwald, Mathematics Max E. Riedlsperger, History
		1985–86 Edward H. Baker, Mechanical Engineering Sue McBride, Education Phillip K. Ruggles, Graphic Communication
		1986–87 Boyd W. Johnson, Mathematics Craig H. Russell, Music Calvin H. Wilvert, Social Sciences

- 1987–88 James R. Mueller, Mathematics
Ronald S. Mullisen, Mechanical Engineering
Robert G. Reynolds, Art and Design
- 1988–89 Stephen W. Ball, Philosophy
George Cotkin, History
Abraham B. Shani, Management
- 1989–90 Lloyd N. Beecher, History
Talmage E. Scriven, Philosophy
Jan W. Simek, Chemistry
- 1990–91 Jay L. Devore, Statistics
Linda H. Halisky, English
Ann Morgan, Psychology
James L. Webb, Physical Education & Recreation Admin.
- 1991–92 Mary E. Pedersen, Food Science and Nutrition
John Snetsinger, History
W. Fred Stultz, Psychology and Human Dev.
- 1992–93 Susan Duffy, Speech Communication
Donald K. Maas, University Center for Teacher Education
Charles M. Slem, Psychology and Human Development
- 1993-94 William T. Little, Foreign Languages and Literatures
Steven R. Marx, English
Raymond M. Nakamura, Physical Education & Kinesiology
- 1994-95 Ronald F. Brown, Physics
Lee B. Burgunder, Business Administration
Nancy Lucas, English
- 1995-96 David Keeling, Chemistry and Biochemistry
John Russell, Music
Richard Simon, English
- 1996-97 Leonard Davidman, University Center for Teacher Education
Al Landwehr, English
Robert Thompson, Agribusiness
- 1997-98 John Culver, Political Science
Jay S. DeNatale, Civil and Environmental Engineering
David R. Henry, Speech Communication
- 1998-99 Colette Frayne, Global Strategy and Law
Carol MacCurdy, English
Leonard Myers, Computer Science
- 1999-00 J. Michael Geringer, Global Strategy and Law
Brent G. Hallock, Soil Science
Clinton A. Staley, Computer Science
- 2000-01 Sky Bergman, Art and Design
Phillip M. Doub, Agribusiness
William Martinez, Jr., Modern Languages and Literatures
- 2001-02 Kevin Clark, English
Alyson McLamore, Music
Mark Zohns, BioResource and Agricultural Engineering
- 2002-03 Alvin De Jong, Biological Sciences
Bernard Duffy, Speech Communication
Linda Vanasupa, Materials Engineering
- 2003-04 Matthew Moelter, Physics
- Robert Smidt, Statistics
Nanine A. Van Draanen, Physics
- 2004-05 Fred DePiero, Electrical Engineering
John Hampsey, English
David Headrick, Horticulture and Crop Science
- 2005-06 Mary Armstrong, English
Michael B. Miller, Art and Design
Yarrow Nelson, Civil and Environmental Engineering
- 2006-07 William Fitzhenry, English
Elena Keeling, Biological Sciences
Donald H. Ryujin, Psychology and Child Development
- 2007-08 Michael Fahs, Communications Studies
Michael Lucas, Architecture
Charles "Tad" Miller, Accounting
- 2008-09 Derek Gragson, Chemistry and Biochemistry
Josh T. Machamer, Theatre and Dance
- 2009-10 Eric J. Kantorowski, Chemistry and Biochemistry
J. Kevin Taylor, Kinesiology
- 2010-11 Thomas H. Davies, Music
Thomas L. di Santo, Architecture
- 2011-12 Emily N. Taylor, Biological Sciences
Umot Toker, City and Regional Planning
Matthew K Ritter, Biological Sciences
- 2012-13 Seth Bush, Chemistry & Biochemistry
Jaymie Noland, Animal Science
Dylan Retsek, Mathematics
- 2013-14 Pat Fidopiastis, Biological Sciences
Matthew Moore, Political Science
Camille O'Bryant, Kinesiology
- 2014-15 Todd Grundmeier, Mathematics
Sandra Stannard, Architecture
Dustin Stegner, English
- 2015-16 Robert D. Clark, Kinesology
Karen Muñoz-Christian, Modern Languages and Literatures
Soma Roy, Statistics
- 2016-17 Brian Kennelly, World Languages and Literatures
Elizabeth Lowham, Political Science
Anthony Mendes, Mathematics
- 2003–04 Charles Burt, BioResource and Agricultural Engineering
Joanne Ruggles, Art and Design
- 2004–05 Estelle Basor, Mathematics
Rami Shani, Management

Distinguished Scholarship Award

In 2003-04 Cal Poly instituted an award program to recognize faculty in the areas of distinguished research, creative activity, and professional development. Nominations are solicited from the faculty, students, and alumni, and the Academic Senate's research and professional development committee, a group of eleven, selects the recipients. The recipients of the award and their departments are listed below:

- 2005–06 Daniel Biezad, Aerospace Engineering
Andrew Morris, History
- 2006–07 Mark A. Moline, Biological Sciences
Craig H. Russell, Music
- 2007–08 Terry Jones, Social Sciences
Michael Marlow, Economics
- 2008–09 Patrice L. Engle, Psychology and Child Development
Dean E. Wendt, Biological Sciences
- 2009–10 George Cotkin, History Department
Rafael Jimenez, Dairy Science
- 2010–11 Michael Geringer, Management
Jordi Puig-Suari, Aerospace Engineering
- 2011–12 Christopher Kitts, Biological Sciences
William Hendricks, Recreation, Parks, and Tourism
- 2012–13 Lanny Griffin, Biomedical & General Engineering
Bernard Duffy, Communication Studies
- 2013–14 Steven Klisch, Mechanical Engineering
David Marshall, Aerospace Engineering
- 2014–15 Wyatt Brown, Horticulture & Crop Science
Philip J. Costanza, Chemistry & Biochemistry
Lars Tomanek, Biological Sciences
- 2015–16 Ronald Den Otter, Political Science
Peggy Papathakis, Food Science and Nutrition
William Siembieda, City and Regional Planning
- 2016–17 Patrick Lin, Philosophy
Suzanne Phelan, Kinesiology
Jay Singh, Industrial Technology and Packaging

Learn by Doing Scholar Award

The Learn by Doing Faculty Scholar Award recognizes outstanding faculty scholarship on Cal Poly's signature pedagogy. Given for the first time in spring 2015, the award fosters, encourages, shares, and acknowledges Learn by Doing scholarship conducted by Cal Poly faculty.

- 2014–15 Steffen Peuker, Mechanical Engineering
J. Kevin Taylor, Kinesiology
- 2015–16 Gregory Scott and Alan Kiste, Chemistry and Biochemistry
Brian Self and James Widmann, Mechanical Engineering
- 2016–17 Lynn Metcalf, Entrepreneurship
Catherine Waitinas, English

Outstanding Faculty Advisor Award

In 2001–02 the University instituted a program of recognizing outstanding achievement by a faculty member in the area of student advising. Nominations are solicited from the faculty and staff and students. Recipients' names will be displayed on a perpetual plaque. The recipients of the Outstanding Faculty Advisor Award and their departments are listed as follows:

- 2001–02 Kathryn Rummell, English
2002–03 Jack Robison, Accounting
2003–04 William Preston, Social Sciences

- 2004–05 Lorraine Donegan, Graphic Communication
2005–06 Nfn Taufik, Electrical Engineering
2006–07 Abraham Lynn, Architectural Engineering
2007–08 Cynthia Moyer, Recreation, Parks and Tourism Administration
2008–09 Curtis Illingworth, Architecture
2009–10 Philip Costanzo, Chemistry and Biochemistry
2010–11 Ron Den Otter, Political Science
2011–12 Andrew Davol, Mechanical Engineering
2012–13 Leanne Berning, Dairy Science
2013–14 John Oliver, Electrical Engineering
2014–15 Kristen Cardinal, Biomedical and General Engineering
2015–16 Jenell Navarro, Ethnic Studies
2016–17 Elena Keeling, Biological Sciences

Provost's Leadership Award for Partnership in Philanthropy

This award was established in 2006 to recognize current or former faculty member's superior achievement in fundraising.

- 2006 Allan J. Hauck, Construction Management
James A. Rodger, Construction Management
- 2007 Andrew J. Thulin, Animal Sciences
- 2008 Harvey Robert Levenson, Graphic Communication
- 2009 Charles M. Burt, BioResource and Agricultural Engineering
- 2010 Philip S. Bailey, College of Science and Mathematics
- 2011 Bruce L. Golden, Dairy Science Department
- 2011 Phillip S. Tong, Dairy Science Department
- 2012 Allen Estes, Architectural Engineering Department
- 2013 Ignatios Vakalis, Computer Science
David Wehner, College of Agriculture, Food and Environmental Sciences
- 2014 Jesse Maddren, Mechanical Engineering
- 2015 Jonathan York, Cal Poly Center for Innovation & Entrepreneurship
- 2016 Dennis J. Derickson, Electrical Engineering
- 2017 Raymond H. Fernando, Chemistry and Biochemistry

President's Diversity Award

This award recognizes campus units that exhibit a commitment to the value of cultural diversity.

- 1997 Staff Council Cultural Awareness Committee
- 1998 Staff Council Cultural Awareness Committee
- 1999 Black Faculty & Staff Association
- 2000 26 Hours of Science & Technology in Agriculture
- 2001 Industrial and Manufacturing Engineering
- 2002 Housing and Residential Life
- 2003 Minority International Research Access Program
Connections for Academic Success
- 2004 Summer Institute
- 2005 College of Science and Mathematics
Career Services
- 2006 PolyCultural Committee
Social Sciences Department

2007	Counseling Services Student Life and Leadership	John Lee Gerry Wagner Arthur Young
2008	Department of Psychology & Child Development Omega Xi Delta Fraternity	1975–76 Merriam Erickson Viola Hughes Mary Johnson Boyd Wettlaufer
2009	Multicultural Engineering Program Delta Lambda Phi	1976–77 Trudy Beck Stella Nuncio
2010	Cal Poly Society of Women Engineers Ethnic Studies Department	1977–78 Luther Bertrando Pauline Shaffer Joanna DeRosier
2011	Cal Poly Lion Dance Team Modern Languages and Literatures Department	1978–79 Harold Miller Doris Anderson Richard Tartaglia Frank Lebens
2012	Cultural Inclusion Committee University Housing Driven Towards Sisterhood	1979–80 Dale Lackore Steven Riddell Joan Roberts
2014	Latinos in Agriculture Louis Stokes Alliance for Minority and Underrepresented Student Participation in STEM (LSAMP) Everette Brooks, Staff Dr. Jane Lehr, Faculty	1980–81 Joan Cirone Farlin Halsey Irene Lund
2015	RISE PRISM Renoda Campbell, Staff Dr. Jose Navarro, Faculty	1981–82 James Neal Connie Jonte Frank Kassak
2016	Triota Indigenous Studies in Natural Resources and the Environment (INRE) Minor Catherine Trujillo, Staff Delfina Medina-Maloney, Staff Dr. Unique Shaw-Smith, Faculty	1982–83 Barbara Lund Larry Grimes Norman Johnson
2017	American Indian Student Association Undocumented Student Working Group Justin Gomez, Staff Dr. Jenell Navarro, Faculty	1983–84 Jerald (Louie) Budoff Walter Clark Gail Simmons
		1984–85 Alfred W. Amaral Ethel Spry Kathleen Lamoree
		1985–86 James Landreth Geraldine Montgomery Vicki Stover
		1986–87 Lee Brown Gary Ketcham French Morgan
		1987–88 Lynette Klooster Judi Pinkerton Nancy Raetz
		1988–89 Debbie Arseneau June Powell Jacquie Rossi
		1989–90 Grace Arvidson Janet Carlstrom Ronald Christensen
		1990–91 Barbara Ciesielski Harriet Clendenen Harriet Ross
		1991–92 Wanda Bolt Pam Parsons Joe Risser
		1992–93 Rosemary Bowker Deborah L. Brothwell Andy McMeans
		1993–94 Connie Davis Jim McLaughlin Richard Tibbetts
		1994–95 Francesca Fairbrother
1972–73	Everette Dorrrough	
1973–74	Vic Allen Florence Hauge Lionel Middlecamp Jim Neelands	
1974–75	Robert Baldrige	

Outstanding Staff Employee Award

The 1972-73 academic year saw the inception of the Outstanding Staff Employee Award. This honor is bestowed upon permanent, full-time employees of the University, Corporation, or Associated Students, Inc. who are in at least their fourth year of employment at Cal Poly. In order to be considered for this award, an employee should be truly dedicated and loyal; exhibit expertise in job performance; demonstrate a willingness to assist others enthusiastically; take initiative in making his or her department more efficient and productive; maintain an excellent relationship with co-workers, faculty, and students; and make contributions to both the University and the community. Nominations are solicited from staff employees, faculty members, and department or division heads. Selection of the awardees is made by a committee of former recipients of the award, who recommend the awardees to the President for his final selection. Outstanding Staff Employees Award recipients are listed here as follows.

Joyce Kalicicki
 Lorraine Ridgeway
 1995–96 George Enriquez
 Cynthia Jelinek
 Carol Montgomery
 1996–97 Kristina Pena
 Don Shemenske
 Judy Swanson
 1997–98 Richard Equinoa
 Pat Harris
 Nettie Steels
 1998–99 Darrell Blankenship
 Delores Estrada
 Rosemary Wagner
 1999–00 Bonnie Krupp
 Druci Reese
 Ellen Stier
 2000–01 Donna Amos
 Stacey Breitenbach
 Joyce Haratani
 2001–02 Margaret Booker
 Judy Drake
 Jimmy Ray Motley
 2002–03 Sue Bethel
 Jim Gerhardt
 Bonnie Long
 2003–04 Carol Erickson
 Lori La Vine
 Bob Pinkin
 2004–05 Sharon Arnold
 Prisila Johnson
 Dan Mull
 2005–06 Larry Coolidge
 Alice Gold
 Mary Whiteford
 2006–07 Michele Abba
 Peggy Smith Andersen
 Joyce McAlexander
 2007–08 Carson Crain
 Ben Johnson
 Emanuel Vieira
 2008–09 Vera Gee
 George Leone
 Colleen Rodriguez
 2009–10 Christine Cobb
 Vivian Longacre
 Terry Vahey
 2010–11 Patrick Johnstone
 Nancy Reid
 Yolanda Tiscareno
 2011–12 Helen Bailey
 Shannon Stephens
 Marcy Maloney
 2012–13 Nancy Cochran
 David Harris
 Mark Rapoport
 2013–14 Jean DeCosta
 Tammy Martin
 Craig Stubler
 2014–15 Maria Arvizu-Rodriguez
 Donald Popham
 Donetta Rosson

2015–16 Launnie Gin
 Ray Kisch
 Alexandra Kohler
 2016–17 Josh D'Acquisto
 Monica Cantu
 Ray Ward

Faculty and Staff Emeriti

The faculty and staff, who have served at least ten years of full-time meritorious service at Cal Poly, are awarded emeritus status. A complete list of faculty emeriti is available at: <http://www.academic-personnel.calpoly.edu/content/quicklinks> Contact Human Resources for information regarding staff emeriti. The University appreciates its emeriti members' contributions to the Cal Poly community.

Faculty Directory

NAME	POSITION	EDUCATION
Abercromby, Kira J. (2008) Aerospace Engineering	Associate Professor	B.S., University of California, Los Angeles, 1994; M.S., University of Colorado, Boulder, 1998; Ph.D., 2000.
Adams, Nikki L. (2002) Biological Sciences	Professor	B.A., University of California, Santa Barbara, 1988; M.S., University of Maine, 1995; Ph.D., 2000.
Adams, Aubrie S. (2017) Communication Studies	Assistant Professor	B.A., Sonoma State University, 2005; M.A., Sacramento State University, 2013; Ph.D. University of California at Santa Barbara, 2017.
Adan, Elizabeth (2007) Art and Design	Professor	B.A., University of California, Davis, 1993; M.F.A., University of California, Santa Barbara, 1997; M.A., University of California, Berkeley, 2000; Ph.D., University of California, Santa Barbara, 2006.
Afriyie, Prince (2016) Statistics	Assistant Professor	B.S., Northern Kentucky University, 2010; M.A., Ball State University, 2011; Ph.D., Temple University, 2016.
Agbo, Samuel O. (1991) Electrical Engineering	Professor	B.Sc., University of Nigeria, 1975; M.S.E., University of Michigan, 1978; Ph.D., University of Houston, 1984.
Ahern, James J. (1980) Agribusiness	Professor Emeritus	B.S., California State Polytechnic College, Pomona, 1971; M.S., University of Maryland, 1973; Ph.D., 1980.
Ahlgren, William L. (1999) Electrical Engineering	Associate Professor	S.B., Massachusetts Institute of Technology, 1975; M.S., University of Arizona, 1977; Ph.D., University of Southern California, 1981.
Al-Nakib, Farah (201) History	Assistant Professor	B.A., George Washington University, 2001; M.A., University of London, 2006; University of London, 2011, Ph.D.
Alaniz, Ryan C. (2011) Social Sciences	Associate Professor	B.A., California Polytechnic State University, San Luis Obispo, 2000; M.A., University of California, Santa Barbara, 2004; Ph.D., University of Minnesota, 2012.
Alber, Julia M. (2017) Kinesiology	Assistant Professor	B.S., University of Illinois, Champaign-Urbana, 2010; MPH, University of North Carolina, Greensboro, 2012; Ph.D., University of Florida, 2015.
Alexander, Benjamin (2015) Management, HR, and Information Systems	Assistant Professor	B.S., Tufts University, 2005; M.A., George Mason University, 2009; Ph.D., Tulane University.
Allen, Regulus L. (2006) English	Associate Professor	B.A., University of California, Los Angeles, 1994; M.A., 2000; Ph.D., 2006.
Allen, Teresa (2001) Journalism	Professor Emerita (FERP)	B.A., University of Washington at Seattle, 1976; M.A., University of Colorado at Boulder, 1993; additional graduate study.
Almeida, Daniel J. (2016) School of Education	Assistant Professor	B.A., Dartmouth College, 2002; M.A., Boston College, 2005; Ph.D., University of Southern California, 2016.
Amin, Samir (2015) Food Science and Nutrition	Associate Professor	A.O.S. in Occupational Sciences Culinary Institute of America, 1988; B.S. University of Nevada Las Vegas, 1992; M.S. Michigan State University, 1999; Ph.D. Michigan State University, 2008.
Amspacher, William H. (1985) Wine and Viticulture	Professor Emeritus	B.S., Clemson University, 1978; M.S., 1980; Ph.D. University of California, Davis, 1988.
Anderson, Bing (2004) Finance	Associate Professor	B.Engr., University of Science and Technology of China, 1993; M.A., University of Chicago, 1996; M.S., Stanford University, 2000; Ph.D., 2002.
Anderson, Bradford P. (2006) Accounting	Associate Professor	B.A., Purdue University, 1984; J.D., State University of New York, 1987.
Anderson, Christian (2012) World Languages and Cultures	Assistant Professor	B.A., University of Maryland, College Park, 1995; M.A., University of California, Davis, 2005; Ph.D., 2010.
Andrews, Ameila (2015) Political Science	Assistant Professor	B.A., Case Western Reserve University, 2007; M.A., St. John's University, 2009; Ph.D., Purdue University, 2015.
Appel, Christopher S. (2002) Natural Resources Management and Environmental Sciences	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1995; M.S., 1998; Ph.D., University of Florida, 2001.
Arakaki, Dean Y. (2001) Electrical Engineering	Associate Professor	B.S., California State Polytechnic University, Pomona, 1984; M.B.A., California State University, Long Beach, 1989; M.S., 1992; Ph.D., Penn State University, 2000.

Arceneaux, Craig (2001) Political Science	Professor	B.A., California State University, Fullerton, 1989; M.A., Ohio State University, 1991; Ph.D., University of California, Riverside, 1997.
Archer, Graham C. (2002) Architectural Engineering	Professor	B.A.Sc., University of Waterloo, Canada, 1985; M.A.Sc., 1986; Ph.D., University of California, Berkeley, 1996. Professional Engineer, Ontario.
Arens, Robert M. (2005) Architecture	Professor and Associate Head	B.S., University of Michigan, 1981; M.Arch., 1984. Registered Architect, Michigan.
Arrington, Nancy (2018) Political Science	Assistant Professor	B.A., University of Texas, Austin, 2010; MIP University of Georgia, 2012; Ph.D. Emory University, Georgia, 2018.
Arrivee, David A. (2004) Music	Professor	B.A., Princeton University, 1993; M.M., Boston University, 1995; D.M.A., Northwestern University, 2004.
Askay, David A. (2013) Communication Studies	Assistant Professor	B.S., University of California at San Diego, 2004; M.A. University of North Carolina at Charlotte, 2011; Ph.D. 2013.
Ayash, Brian (2014) Finance	Assistant Professor	B.S., Clarkson University; MBA, University of Rochester; M.S. University of California, Berkeley; Ph.D. University of California, Berkeley.
Babin, Nicholas (2018) Natural Resources Management and Environmental Sciences	Assistant Professor	B.A., UC Santa Cruz, 2004; M.A., UC Santa Cruz, 2008; Ph.D., UC Santa Cruz, 2012.
Bahrami, Sara (2017) Computer Science	Assistant Professor	Ph.D., Wichita State University 2017.
Ball, Stephen W. (1983) Philosophy	Professor	B.A., Purdue University, 1972; M.A., University of Michigan, 1973; Ph.D., 1978.
Baltimore, Craig V. (2001) Architectural Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1986; M.S., Duke University, 1996; Ph.D., 1998. Registered Structural Engineer and Professional Engineer, California.
Barata, Antonio G. (1985) Music	Professor	B.A., Towson State University, 1977; M.M., Northwestern University, 1979; D.M.A., University of Illinois, 1985.
Barlow, Philip L. (2006) Construction Management	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1987; M.B.A., Golden Gate University, 1993; Ph.D., University of Florida, 2015; Licensed General Contractor, Licensed Broker, Certified Professional Constructor (CPC), Certified Cost Consultant (CCC), Designated Design-Build Professional (DBIA), LEED Accredited Professional (LEED AP).
Bass, Beverly J. (2008) Landscape Architecture	Associate Professor	B.F.A., East Carolina University, 1982; M.L.A., University of Arizona, 2003. LEED Accredited Professional. Certified Arborist, Registered Landscape Architecture, California.
Bates, G.W. (2018) BioResource and Agricultural Engineering	Assistant Professor	B.S., California Polytechnic State University, San Luis Obispo, 2003; M.S. University of Washington, Seattle, 2011; Ph.D., Texas Tech University, Lubbock, 2017. Registered Civil Engineer, CA.
Battenburg, John (1989) English	Professor	B.A., Andrews University, 1982; M.A., Ohio University, 1984; Ph.D., Purdue University, 1989.
Battle, Martin (2015) Political Science	Assistant Professor	B.A., University of Sheffield, 1997; M.A., University of Wisconsin, Milwaukee, 2000; Ph.D., Washington University, St. Louis, 2006.
Beaton, Brian (2015) History	Assistant Professor	B.A., Emory University, 2000; M.A., New York University, 2002; University of Toronto, Ph.D., 2012.
Bednarek, Ziemowit K. (2012) Finance	Associate Professor	Ph.D., University of California, Berkeley, 2010.
Beekman, Matthew (2016) Physics	Assistant Professor	B.S., University of South Florida, 2003; M.S., 2006; Ph.D., 2009.
Behrouzi, Anahid (2016) Architectural Engineering	Assistant Professor	B.S., North Carolina State University, Raleigh, 2011; M.S., University of Illinois, Urbana-Champaign, 2013; Ph.D., University of Illinois, Urbana-Champaign, 2016.
Bellardo, John M. (2006) Computer Science, Computer Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1999; M.S., University of California, San Diego, 2001; Ph.D., 2006.
Bennert, Vardha N. (2011) Physics	Associate Professor	B.S., Ruhr-University of Bochum, Germany, 1999; M.S., 2002; Ph.D., 2005.
Bennett, Darin C. (2014) Animal Science	Assistant Professor	B.Sc., University of Guelph, 1986; M.Sc., University of British Columbia, 1993; Ph.D., University of British Columbia, 2002.

Bennett, Penny K. (2000) College of Liberal Arts	Associate Dean	B.S., Ferris State University, 1986; M.E., University of Nevada, Las Vegas, 1992; Ph.D., University of Idaho, 2002.
Bennion, Kelly Ann (2016) Psychology and Child Development	Assistant Professor	B.A., Middlebury College, 2010; Ed.M., Harvard Graduate School of Education, 2011; Ph.D., Boston College, 2016.
Bensky, Thomas J. (2001) Physics	Professor	B.S., California State University, Northridge, 1992; Ph.D., University of Virginia, 1998.
Benson, Bridget G. (2011) Electrical Engineering, Computer Engineering	Associate Professor	B.S., California Polytechnic State University, San Luis Obispo, 2005; M.S., University of California Santa Barbara, 2007; Ph.D., University of California, San Diego, 2010
Berber-Jimenez, Lola (1995) Liberal Studies	Department Chair	B.S., Universidad LaSalle, 1983; Ph.D., University of California, Davis, 1990. K-5 Teaching Credential.
Bergman, Sky (1995) Art and Design	Professor	B.S., University of South Florida, 1987; M.F.A., University of California, Santa Barbara, 1991.
Bernard, Thomas J. (2008) Theatre and Dance	Associate Professor	B.A., University of Minnesota, 1991; M.F.A., Northern Illinois University, 1995.
Berning, Leanne M. (1990) Animal Science	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1982; M.S., University of Wisconsin, 1985; Ph.D., University of Maryland, 1990.
Besel, Richard D. (2007) Communication Studies	Professor	B.A., North Central College, 1999; M.A., University of Illinois, Chicago, 2001; Ph.D., University of Illinois, Champaign/Urbana, 2007.
Bettergarcia, Jay (2017) Psychology and Child Development	Assistant Professor	B.S., California Polytechnic State University, San Luis Obispo, 2009; M.A., San Francisco State University, 2011; Ph.D., University of California, Santa Barbara, 2016.
Birdsong, Charles B. (2003) Mechanical Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S., Michigan State University, 1996; Ph.D., 1999.
Black, Michael W. (2001) Biological Sciences	Professor	B.S., Southwest Missouri State, 1993; Ph.D., Stanford University, 1999.
Blank, Jason M. (2009) Biological Sciences	Associate Professor	B.S., Duke University, 1996; Ph.D., Stanford University, 2006.
Blau, Nnan A. (2008) Communication Studies	Associate Professor	B.S., Arizona State University West, 1999; M.S., Southern Illinois University, 2002; Ph.D., 2007.
Bodwin, Kelly N. (2017) Statistics	Assistant Professor	B.A., Harvard University, 2011; Ph.D., University of North Carolina, 2017.
Bohr, Gregory S. (2005) Social Sciences	Associate Professor	B.A., University of California, Berkeley, 1993; M.A., San Diego State University, 1997; Ph.D., Louisiana State University, 2004.
Bonini, Vincent (2008) Mathematics	Associate Professor	B.A., University of California, Santa Cruz, 2000; M.A., 2001; Ph.D., 2006.
Bordeman, Adam (2015) Accounting	Assistant Professor	B.S., Marquette University, 2006; M.S., Marquette University, 2007; Ph.D., University of Colorado at Boulder, 2015.
Borin, Norm A. (1992) Marketing	Professor	B.S., University of California, Davis, 1981; M.B.A., California State University, Sacramento, 1987; Ph.D., University of Virginia, Charlottesville, 1992.
Borzellino, Joseph E. (2001) Mathematics	Professor	B.S., University of California, Irvine, 1987; M.A., University of California, Los Angeles, 1989; Ph.D., 1992.
Boswell, Michael R. (1998) City and Regional Planning	Professor and Department Head	B.A., University of Central Florida, 1989; M.S.P., Florida State University, Tallahassee, 1991; Ph.D., 2000.
Brady, Pamalee (1998) Architectural Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1979; M.S., University of California, Berkeley, 1980; Ph.D., University of Illinois, Urbana-Champaign, 2004. Registered Civil Engineer, California.
Brammeier, Meredith (2001) Music	Professor	B.A., Princeton University, 1992; M.M., Eastman School of Music, 1995; D.M.A., University of Southern California, 2000.
Braun, David B. (1996) Electrical Engineering, Computer Engineering	Professor	B.S., Stanford University, 1985; M.S., 1986; Ph.D. University of California, Santa Barbara, 1991.
Bridger, Sarah (2011) History	Associate Professor	B.A., Brown University, 2000; M.A., Columbia University, 2005; M.Phil, 2006; Ph.D., 2011.
Brown, D. Kenneth (2007) Philosophy	Associate Professor and Department Chair	B.A., University of California, Irvine, 1992; M.A., Claremont Graduate University, 1998; Ph.D., University of California, Irvine, 2006.

Brown, J. Wyatt (1990) Horticulture and Crop Science	Professor	B.S., Louisiana State University, 1978; M.S., 1985; Ph.D., Cornell University, 1990.
Brown, Gregory G. (2016) Natural Resources Management and Environmental Sciences	Professor and Department Head	B.S., Northern Arizona University, 1980; M.B.A., Northern Arizona University, 1982; B.S.B.A., Northern Arizona University, 1983; Ph.D., University of Idaho, 1992.
Brussel, Eric S. (2012) Mathematics	Professor	B.A., University of California, Santa Cruz 1982; Ph.D., University of California, Los Angeles, 1993.
Buckalew, W. Chris (1990) Computer Science	Professor	B.S., North Texas State University, 1980; M.S., 1982; M.S., 1984; Ph.D., University of Texas, 1990.
Burd, Matthew A. (2003) Animal Science	Professor	B.S., University of Wisconsin–Madison, 1987; M.S., San Jose State University, 1991; D.V.M., University of California, Davis, 1996.
Burgunder, Lee B. (1983) Accounting	Professor	B.A., Dartmouth College, 1977; M.B.A., Stanford University, 1981; J.D., 1981.
Burke, Ellen (2014) Landscape Architecture	Assistant Professor	B.A., Vassar College, 1997; M.L.A., Harvard University Graduate School of Design, 2005.
Burleson, James (2014) Management, HR, and Information Systems	Assistant Professor	B.B.A., Baylor University; M.B.A., Auburn University.
Burn, Shawn Meghan (1990) Psychology and Child Development	Professor	B.S., Virginia Commonwealth University, 1982; M.A., The Claremont Graduate University, 1984; Ph.D., 1988.
Burt, Charles M. (1978) BioResource and Agricultural Engineering	Professor Emeritus	B.S., California Polytechnic State University, San Luis Obispo, 1973; M.S., Utah State University, 1975; Ph.D., 1983. Registered Civil Engineer and Agricultural Engineer, California. Registered Professional Engineer, Utah.
Bush, Seth (2005) Chemistry and Biochemistry	Professor and Department Chair	B.S., Reed College, 1994; Ph.D., University of California, Berkeley, 1999.
Byrne, Andrew M. (2017) School of Education	Assistant Professor	B.A., Grove City College, 1996; M.S., East Carolina University, 2005; M.S., East Carolina University, 2005; Ph.D., East Carolina University, 2013.
Cabrinha, Mark (2003) Architecture	Professor and Associate Dean	B.Arch., California Polytechnic State University, San Luis Obispo, 1995; M.Arch., University of Illinois, 2001; Ph.D., Rensselaer Polytechnic Institute, 2010. Registered Architect, Illinois.
Cacciamani, Laura (2016) Psychology and Child Development	Assistant Professor	B.S., Carnegie Mellon University, 2009; M.A., The University of Arizona, 2010; Ph.D., 2014.
Cai, Xiaowei (2008) Agribusiness	Associate Professor	B.S., M.S., Nanjing Agricultural University, 2001; M.S., Ph.D., University of Wisconsin, 2009.
Call, Lewis W. (1996) History	Professor	B.A., University of California, San Diego, 1990; M.A., University of California, Irvine, 1992; Ph.D., 1996.
Callenes-Sloan, Joseph (2017) Electrical Engineering, Computer Engineering	Assistant Professor	B.S., Iowa State University of Science and Technology, Ames, 2007; M.S., University of Illinois at Urbana-Champaign, 2011; Ph.D., University of Illinois at Urbana-Champaign, 2013.
Camp, Charles D. (2007) Mathematics	Associate Professor	B.A., University of California, San Diego; 1989; Ph.D., California Institute of Technology, 2004.
Campbell, Brad (2007) English	Associate Professor	B.A., St. Mary's College of California, 1997; M.A., University of Illinois at Urbana-Champaign, 1999; Ph.D., 2007.
Campos Chillon, Fernando (2011) Animal Science	Professor	B.S., California State Polytechnic University, Pomona, 1997; M.S., 2000; DVM, Colorado State University, 2004; Ph.D., 2009; Diplomate American College of Theriogenologists, 2009.
Cannon, Karen J. (2018) Agricultural Education and Communication	Assistant Professor	B.A., Colorado State University, Fort Collins, 2000; M.S., 2003; Ph.D., University of Florida, 2011.
Caplan, Lana Z (2016) Art and Design	Assistant Professor	B.A., Boston University, 1994; M.F.A., Massachusetts College of Art and Design, 2006.
Cardinal, Kristen O'Halloran (2007) Biomedical Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 2003; Ph.D., University of Arizona, 2007.
Cardinal, Trevor (2007) Biomedical Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 2003; Ph.D., University of Arizona, 2007.
Carlton, Matthew A. (1999) Statistics	Professor	B.A., University of California, Berkeley, 1994; M.A., University of California, Los Angeles, 1996; Ph.D., 1999.

Carr, Chris A. (1998) Accounting	Professor	B.A., University of Nebraska, 1987; M.A., University of California, Los Angeles, 1998; J.D., Santa Clara University, 1990.
Carrigan, Coleen M. (2014) Social Sciences	Assistant Professor	B.A., College of the Holy Cross, 1996; M.A., University of Washington, 2009; Ph.D., University of Washington, 2013.
Carroll, Jennifer (2006) Chemistry and Biochemistry	Professor	B.S., Sonoma State University, 1996; Ph.D., University of California, Santa Cruz, 2001.
Carter, Amy (2007) Orfalea College of Business	Assistant Dean	B.A., Chico State University, 2000. M.A., California Polytechnic State University, San Luis Obispo, 2007.
Casassa, Luis Federico (2015) Wine and Viticulture	Assistant Professor	B.S., Cuyo National University, Mendoza, Argentina, 2004; M.S., 2007; Ph.D. Washington State University, 2013.
Castillo, Alfred (2018) Management, HR, and Information Systems	Assistant Professor	B.S., Park University 2010, M.Sc. Florida International University 2011, Ph.D. Floriday International University 2017
Castro, Luis (2015) Food Science and Nutrition	Assistant Professor	B.S., University of Costa Rica, 2004; Licentiate, University of Costa Rica, 2006; M.S., Washington State University, 2009; Ph.D., Washington State University, 2013.
Cavaletto, Richard A. (1990) College of Agriculture, Food and Environmental Sciences	Executive Associate Dean	B.S., California Polytechnic State University, San Luis Obispo, 1981; M.S., University of California, Davis, 1983; Ph.D., 1987. Registered Mechanical Engineer, California.
Cerf, Douglas C. (1990) Accounting	Professor and Area Chair	B.S., University of California, Berkeley, 1978; M.A., University of California, Davis, 1987; Ph.D., 1991.
Chadwell, Charles (2003) Civil and Environmental Engineering	Professor and Department Chair	B.S., University of California, Berkeley, 1997; M.S., 1998; Ph.D., 2003. Registered Professional Engineer, California.
Champney, Danielle (2013) Mathematics	Assistant Professor	B.S., Bowling Green State University, 2007; M.A., University of California, Berkeley, 2010; Ph.D., 2013.
Chance, Beth L. (1999) Statistics	Professor	B.S., Harvey Mudd College, 1990; M.S., Ph.D., Cornell University, 1994.
Chatziioanou, Alypius E. (1992) Civil and Environmental Engineering	Professor Emeritus	B.S., Athens Polytechnic, 1980; M.S., University of California, Berkeley, 1982; Ph.D., 1989. Registered Professional Engineer, Greece.
Chen, Sophia (2010) World Languages and Cultures	Associate Professor	Ph.D., Florida State University, 2007.
Chen, John (2008) Mechanical Engineering	Professor	B.S., University of Virginia, 1984; M.S., Stanford University, 1987; Ph.D., 1991.
Chen, Katherine C. (1999) Materials Engineering	Professor	B.S., B.A., Michigan State University, 1990; Ph.D., Massachusetts Institute of Technology, 1996.
Chen, Leida (2014) Management, HR, and Information Systems	Professor and Area Chair	M.B.A., University of Central Arkansas, 1996; Ph.D., University of Memphis, 2000.
Chiu, Yi-wen (2014) Natural Resources Management and Environmental Sciences	Assistant Professor	B.S., National Taiwan University, 1996; M.S., University of Minnesota, 2006; Ph.D., University of Minnesota, 2010.
Choboter, Paul F. (2005) Mathematics	Professor	B.Sc., Simon Fraser University, 1995; M.Sc., McGill University, 1997; Ph.D., University of Alberta, 2002.
Choudhury, Gour (2011) Food Science and Nutrition	Professor	B.S., University of Gauhati, India, 1972; M.S., University of Mysore, India, 1977; Ph.D., University of Alberta, Canada, 1987.
Christiansen, Jodi (2006) Physics	Professor	B.A., Harvey Mudd College, 1985; M.S., University of Wisconsin, Madison, 1988; Ph.D., 1993.
Clague, David (2007) Biomedical Engineering	Professor	B.S., University of California, Santa Barbara, 1987; M.S., University of California, Davis, 1993; Ph.D., 1997.
Clark, Robert D. (1998) Kinesiology	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1992; M.S., Louisiana State University, 1996; Ph.D., 1998.
Clay, Gary R. (1995) Landscape Architecture	Professor	B.L.A., Utah State University, 1974; M.L.A., University of Illinois, 1986; Ph.D., University of Arizona, 1996.
Clement, Sandra L. (2011) Biological Sciences	Associate Professor	B.S., Doane College, 1995; Ph.D., Michigan State University, 2004.
Clements, John (2005) Computer Science	Professor	B.A., Princeton University, 1996; M.S., Rice University, 2001; Ph.D., Northeastern University, 2005.

Clifford, Dale T. (2014) Architecture	Associate Professor	B.Arch., Pratt Institute, 1993; M.S. Architectural Studies, Massachusetts Institute of Technology, 1999. Registered Architect, Arizona.
Cobb, Richard (2017) Natural Resources Management and Environmental Sciences	Assistant Professor	B.S., Northern Arizona University, 1996; M.S., University of Maine, 2000; Ph.D., University of California Davis, 2010.
Coget, Jean-Francois Axel Hugues (2006) Management, HR, and Information Systems	Professor and Associate Dean	M.B.A., HEC School of Management, Paris, France, 1998; Ph.D., University of California, Los Angeles, 2004.
Cole, Matthew (2015) Economics	Assistant Professor	B.S., University of Northern Iowa, 2001; M.S., University of Northern Iowa, 2003; Ph.D., University of Oregon, 2009.
Coleman, James W. (1973) Social Sciences	Professor Emeritus	B.A., California State University, Northridge, 1969; M.A., University of California, Santa Barbara, 1971; Ph.D., 1975.
Colvin, Kurt (1999) Industrial and Manufacturing Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S., Oregon State University, 1997; Ph.D., 1999. Registered Professional Engineer, California.
Connolly, Cristina A. (2015) Agribusiness	Assistant Professor	B.A., Middlebury College, 2007; M.S., Ohio State University, 2011; Ph.D., 2015.
Conway-Silva, Bethany A. (2015) Communication Studies	Assistant Professor	B.A., University of New Mexico, 2007; M.A., University of Arizona, 2011; Ph.D., 2015.
Cooper, Kevin (2000) Graphic Communication	Professor Emeritus	B.S., California Polytechnic State University, San Luis Obispo, 1980; M.B.A., University of Southern California, 1990.
Costanzo, Philip (2007) Chemistry and Biochemistry	Professor	B.S., Carnegie Mellon University, 2001; Ph.D., University of California, Davis, 2005.
Costello, Enrica Lovaglio (2002) Art and Design	Associate Professor	M.A., University of California, Santa Barbara, 2001; M.F.A. equivalent, University of Studies of Genova, Italy, 1996.
Costello, Michael J. (1999) Wine and Viticulture	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1981; Ph.D., University of California, Berkeley, 1992. Pest Control Advisor. Pest Control Advisor.
Cousins, Stella (2018) Natural Resources Management and Environmental Sciences	Assistant Professor	B.S., Stanford, 2004; M.F., Yale University, 2010; Ph.D., UC Berkeley, 2016.
Crockett, Robert (2003) Biomedical Engineering	Professor and Department Chair	B.S., University of California, Berkeley, 1989; M.B.A., Pepperdine University, 1992; Ph.D., University of Arizona, 1997.
Crutchfield, Stephen A. (2015) School of Education	Assistant Professor	B.S., Missouri State University, 2005; M. Ed., The University of Kansas, 2010; Ph.D., The University of Kansas, 2014.
D'Avignon, India (2007) Music	Professor	B.M.E., Wittenberg University, 1974; M.A., The Ohio State University, 1980.
da Silva, Bruno (2017) Computer Science	Assistant Professor	B.S., Ruy Barbosa College, Brazil, 2005; M.S., Federal University of Rio Grande do Sul, Brazil, 2009; Ph.D., Federal University of Bahia, Brazil, 2015.
Dahm, Patricia (2015) Management, HR, and Information Systems	Assistant Professor	B.S., University of Notre Dame; M.B.A., University of Illinois Urbana-Champaign; Ph.D., University of Minnesota.
Dandekar, Hemalata (2009) City and Regional Planning	Professor	B.Arch., University of Bombay, India, 1967; M.Arch, University of Michigan, 1969; Ph.D., University of California, Los Angeles, 1978. Registered Architect, California.
Dang, Li (2007) Accounting	Associate Professor	Ph.D., Drexel University, 2004.
Daniels, Denise H. (2003) Psychology and Child Development	Professor	B.A., University of California, Santa Barbara, 1982; M.A., Pacific Oaks College, 1983; Ph.D., University of California, Los Angeles, 1992.
Danowitz, Andrew R. (2014) Electrical Engineering, Computer Engineering	Assistant Professor	B.S., Harvey Mudd College, Claremont, 2008; M.S., Stanford University, 2010; Ph.D., Stanford University, 2014.
Davidson, Jean M. (2018) Biological Sciences	Assistant Professor	B.S., University of California, Davis, 2005; Ph.D., University of North Carolina, Chapel Hill, 2012.
Davis, Steven C. (1987) Kinesiology	Professor	B.S., University of California, Davis, 1979; M.S., San Diego State University, 1983; Ph.D., Pennsylvania State University, 1986.

Davis, Brennan (2014) Marketing	Associate Professor	B.S. University of California, Los Angeles, 1992; M.B.A. University of Pennsylvania, 2003; Ph.D. University of California, Irvine, 2008
Davol, Andrew I. (1999) Mechanical Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1987; M.S., University of California, San Diego, 1993; Ph.D., 1998. Registered Professional Engineer, California.
Dawson, Scott A. (2014) Orfalea College of Business	Dean	B.S., University of Oregon, 1978; M.B.A., University of Arizona, 1981; Ph.D., University of Arizona, 1984.
Day, Miran (2015) Landscape Architecture	Assistant Professor	B.S.L.A., Chonnam National University, South Korea, 1994; M.L.A., University of Illinois, 2011. Registered Landscape Architect, Florida and South Korea.
de la Fuente, Javier (2013) Industrial Technology and Packaging	Assistant Professor	B.S., University of Buenos Aires, Argentina, 1998; M.S., Michigan State University, 2006; Ph.D., Michigan State University, 2013.
De Lay, Ann M. (2008) Agricultural Education and Communication	Associate Professor	B.S., California State University, Fresno, 1997; M.S., California Polytechnic State University, San Luis Obispo, 2002; Ph.D., University of Florida, 2008.
DeBruhl, Bruce E. (2015) Computer Science, Computer Engineering	Assistant Professor	B.S. Kettering University, 2009; M.S. Carnegie Mellon University, 2013; Ph.D. 2015.
Decock, Charlotte L.M. (2017) Natural Resources Management and Environmental Sciences, Horticulture and Crop Science	Assistant Professor	B.S., UGENT, 2005; M.S., Ghent University, 2007; Ph.D., University of California Davis, 2012.
Deffo, Arnold (2018) Aerospace Engineering	Assistant Professor	B.S. Wichita State, 2013; M.S., California Institute of Technology, 2014; Ph.D., California Institute of Technology 2018
Deif, Ahmed (2014) Industrial Technology and Packaging	Assistant Professor	B.S., American University, Cairo, 1999; M.A.Sc, University of Windsor, Canada, 2003; Ph.D., University of Windsor, Canada, 2006.
Deigert, Michael (2017) Architectural Engineering	Assistant Professor	
Deigert, Michael (2017) Architectural Engineering	Assistant Professor	B.S., California Polytechnic State University, San Luis Obispo, 1992; M.S., San Jose State University, 1995. Registered Civil Structural Engineer, California, Arizona. Registered Civil Engineer, Colorado.
Dekhtyar, Alexander (2007) Computer Science	Professor	Ph.D., University of Maryland College Park, 2000.
Del Rio Nascimento, Vicente (2001) City and Regional Planning	Professor	B.Arch., Federal University of Rio de Janeiro, 1978; Graduate Diploma in Urban and Regional Planning, State University of Rio de Janeiro, 1979; M.A., Oxford Polytechnic, 1981; Ph.D., University of São Paulo, 1991. Registered Architect, Brazil.
Delbridge, Timothy A. (2015) Agribusiness	Assistant Professor	B.A., University of Wisconsin, 2003; M.S. University of Minnesota, 2011; Ph.D., 2015.
Den Hartog, Christopher (2006) Political Science	Professor	B.A., University of California, San Diego, 1996; Ph.D., 2004.
Den Otter, Ronald (2005) Political Science	Professor	B.A., University of California, Davis, 1989; J.D., University of Pennsylvania, 1992; Ph.D., University of California, Los Angeles, 2003.
Denbow, Jennifer (2015) Political Science	Assistant Professor	B.S., University of Michigan, 2003; J.D., University of California, Berkeley, 2007; Ph.D., University of California, Berkeley, 2010.
DePiero, Fred W. (1996) College of Engineering, Electrical Engineering, and Computer Engineering	Professor	B.S., Michigan State University, 1985; M.S., 1987; Ph.D., University of Tennessee, 1996.
Derelian, Doris (2004) Food Science and Nutrition	Professor Emeritus (FERP)	B.S., California State University, Fresno, 1968; M.S., University of California, Davis, 1975; Ph.D., University of California, Los Angeles, 1994; J.D., University of California, Davis, 2001. Registered Dietitian.
Derickson, Dennis (2005) Electrical Engineering	Professor and Department Chair	B.S., South Dakota State University, 1981; M.S., University of Wisconsin–Madison, 1988; Ph.D., University of California, Santa Barbara, 1992.

DeTurris, Dianne J. (1998) Aerospace Engineering	Professor	B.S., Georgia Institute of Technology, 1984; M.S., Pennsylvania State University, 1986; Ph.D., Virginia Polytechnic Institute and State University, 1992.
Dhillon, Anuraj (2018) Communication Studies	Assistant Professor	B.C.A., GND University, 2004; M.B.A., ICFAI University, 2006; Ph.D., University of Connecticut, 2018.
Dicus, Christopher A. (2001) Natural Resources Management and Environmental Sciences	Professor	B.S., Louisiana Tech University, 1992; M.S., Utah State University, 1995; Ph.D., Louisiana State University, 2000. Registered Professional Forester, California. Certified Senior Fire Ecologist.
Dietterick, Brian C. (1994) Natural Resources Management and Environmental Sciences	Professor and Director, Swanton Pacific Ranch	B.A., University of Pennsylvania, 1980; M.S., University of Arizona, 1982; Ph.D., Penn State University, 1994.
Disanto, Thomas L. (2003) Architecture	Professor	M.Arch., California State Polytechnic University, Pomona, 1989; B.Arch, 1997; Ecole D'Architecture De Paris, La Defense, 1999. Registered Architect, California.
Djassemi, Manocher (2003) Industrial Technology and Packaging	Professor	B.S., University of Science and Technology, Tehran, 1977; M.S., University of Wisconsin–Milwaukee, 1990; Ph.D., 1994.
Dobson, John (1990) Finance	Professor and Area Chair	B.A., University of Lancaster, England, 1979; M.A., University of South Carolina, 1981; Ph.D., 1988.
Dodson Peterson, Jean (2014) Wine and Viticulture	Assistant Professor	B.S., University of California, Davis, 2009; M.S., 2011; Ph.D., 2014.
Doi, Jimmy A. (2003) Statistics	Professor	B.A., California State University, Northridge, 1995; M.S., North Carolina State University, 1998; Ph.D., 2003.
Doig, Graham (2015) Aerospace Engineering	Assistant Professor	B.Eng., University of Glasgow, Scotland, 2004; M.Eng., University of Glasgow, Scotland, 2004; Ph.D., University of New South Wales, 2009.
Dolan, Dale S. L. (2009) Electrical Engineering	Associate Professor	B.S., University of Toronto, Ontario, Canada, 2003; M.S., 2005; Ph.D., 2008.
Donegan, Lorraine D. (2002) Graphic Communication	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1997; M.A., 2001.
Dong, Kevin J. (2001) Architectural Engineering	Associate Dean and Professor	B.S., California Polytechnic State University, San Luis Obispo, 1986; M.S., University of California, Berkeley, 1988. Registered Structural Engineer and Professional Engineer, California.
Doremus, Jaqueline (2015) Economics	Assistant Professor	B.S., Stanford University, 2004; M.A., University of Michigan, 2010; Ph.D., University of Michigan 2015.
Drake, Aaron (2014) Aerospace Engineering	Associate Professor	B.S., San Jose State; M.S., Stanford; Ph.D., Washington State University.
Drasco, Steve (2014) Physics	Assistant Professor	B.S., University of California, Irvine, 1999; M.S., Cornell University, 2003; Ph.D., 2005.
Duffy, Bernard K. (1988) Communication Studies	Professor and Department Chair	B.A., San Jose State College, 1970; M.A., 1971; Ph.D., University of Pittsburgh, 1976.
Durham, Garland B. (2014) Finance	Associate Professor	B.S., University of Kentucky, 1983; M.S., University of Illinois, 1985; Ph.D., University of North Carolina, 2001.
Eagon, Scott C. (2014) Chemistry and Biochemistry	Assistant Professor	B.A., Whitman College, 2005; Ph.D., University of California Santa Cruz, 2010.
Easterbrook, John (2016) English	Assistant Professor	B.A., Manhattan College, 2004; M.A., New York University, 2008; Ph.D., 2015.
Easton, Robert W. (2011) Mathematics	Associate Professor	B.S., University of Michigan, 2002; Ph.D., Stanford University, 2007.
Echols, Robert (1999) Physics	Professor	B.S., University of California, Davis, 1992; M.S., 1994; M.S., University of California, Santa Cruz, 1996; Ph.D., 1999.
Eckhardt, Christian (2017) Computer Science	Assistant Professor	Ph. D., Vienna University of Technology, Austria, 2011.
Edwards, Mark S. (2007) Animal Science	Professor	B.A., Miami University, 1987; Ph.D., Michigan State University, 1995.
Edwards, Louise O.V. (2016) Physics	Assistant Professor	B.S., University of Victoria, Canada, 2001; M.S., Saint Mary's University, Canada, 2003; Ph.D., Université Laval, Canada, 2007.

Elghandour, Elthary (2000) Mechanical Engineering	Associate Professor	B.S., Helwan University, Cairo, Egypt 1983; M.S. 1989; Ph.D., 1995.
Eller, Dan (2006) Journalism	Professor Emeritus (FERP)	B.S. California State University, Northridge, 1984; M.P.H., 1987; Ed.D., University of California, Santa Barbara, 2010.
Ellis, Allison M. (2016) Management, HR, and Information Systems	Assistant Professor	B.A., University of California, Irvine, 2009; M.S., Portland State University, 2012; Ph.D., Portland State University, 2015.
Emberley, Richard (2017) Mechanical Engineering	Assistant Professor	B.S. Worcester Polytechnic Institute, 2011; M.S., 2013; Ph.D., University of Queensland, Brisbane, Australia, 2017.
Emyan, Mariam (2007) College of Architecture and Environmental Design	Assistant Dean	B.S., Armenian Agrarian University, Armenia, 1997; M.A., Public Administration Academy, Armenia, 1999; M.B.A., California Polytechnic State University, San Luis Obispo, 2006.
Estes, Allen C. (2007) Architectural Engineering	Professor and Department Head	B.S., United States Military Academy, 1978; M.S., Stanford University, 1987; M.B.A., Long Island University, 1989; Ph.D., University of Colorado, 1997. Registered Civil Engineer, Virginia.
Estrada, Aaron R. (2012) Psychology and Child Development	Associate Professor	B.A., University of California, Santa Cruz, 2001; M.S., San Francisco State University, 2006; M.A., University of California, Santa Barbara, 2008; Ph.D., 2011.
Fagan, Kevin (2001) World Languages and Cultures	Associate Professor	B.A., Gregorian University, Rome, 1972; M.A., 1977; M.A., Texas Tech University, 2000; Ph.D., University of Dallas, 1998; Ph.D. Texas Tech University, 2003.
Falessi, Davide (2015) Computer Science	Associate Professor	B.S., University of Rome Tor Vergata, 2002; M.S., 2004; Ph.D., 2008.
Farber, Charmaine (2015) Graphic Communication	Assistant Professor	B.F.A., University of Iowa 1999; M.A., Savannah College of Art and Design, 2008; M.F.A., University of Iowa, 2010.
Faruque, Omar (1989) Landscape Architecture	Professor and Department Chair	B.S.L.A., Texas A M University, 1971; M. Arch., 1972. Registered Architect, Texas, and Landscape Architect, Texas and Indiana.
Faure, Pauline (2018) Aerospace Engineering	Assistant Professor	B.S., Instiut National Polytechnique de Lorraine, 2008; M.S., Kyushu Institute of Technology; Ph.D., Kyushu Instiute of Technology 2017
Fernando, Raymond (2002) Chemistry and Biochemistry	Professor	B.S., University of Sri Jayewardenepura, Sri Lanka; Ph.D., North Dakota State University, Fargo, 1986.
Fernflores, Francisco (2000) Philosophy	Professor	B.Sc., University of Toronto, 1992; M.A., University of Western Ontario, 1993; Ph.D., 1998.
Fernflores, Rachel (2006) Philosophy	Associate Professor	B.A., University of Regina, 1993; M.A., University of Saskatchewan, 1995; Ph.D., Queens University, 2006.
Fernsler, Jonathan (2006) Physics	Professor	B.S., College of William and Mary, 1996; M.S., University of Colorado, Boulder, 1999; Ph.D., 2004.
Fidopiastis, Pantelis M. (2006) Biological Sciences	Professor	B.A., California State University, Fullerton, 1992; M.A., 1995; Ph.D., University of Hawaii, Manoa, 2001.
Fiegel, Gregg L. (1995) Civil and Environmental Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1990; M.S., University of California, Davis, 1992; Ph.D., 1995. Registered Professional Engineer and Geotechnical Engineer, California.
Fiorenza, Giancarlo (2008) Art and Design	Professor and Department Chair	B.A., University of California, Santa Cruz, 1991; M.A., Johns Hopkins University, 1993; Ph.D., 2001.
Firpo, Christina E. (2006) History	Professor	B.A., The George Washington University, 2000; M.A., University of California, Los Angeles, 2002; Ph.D., 2007.
Fischer, Stefanie (2015) Economics	Assistant Professor	B.S., Linfield College, 2005; M.A., Montana State University, 2009; Ph.D., University of California, Santa Barbara, 2015.
Fisher, Eric (2007) Economics	Professor	M.A., John Hopkins School of Advanced International Studies, 1979; Ph.D., University of California, Berkeley, 1985.
Fitzhenry, William (1997) English	Associate Professor	B.A., State University of New York at Buffalo, 1984; M.A., University of Colorado, 1991; Ph.D., Duke University, 1997.
Fleischer, Amy S. (2018) College of Engineering	Dean	B.S.M.E., Villanova University, 1991; M.S.M.E., 1996; Ph.D., University of Minnesota, 2000
Flores, Robert A. (1983) Agricultural Education and Communication	Professor and Department Head	B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., 1978; Ph.D., Texas A M University, 1989.

Flores, Carlos A. (2013) Economics	Professor	B.A., Monterey Institute of Technology, Mexico, 1998; M.A., UC Berkeley, 2003; Ph.D., UC Berkeley, 2005.
Floyd, Barry (1990) Management, HR, and Information Systems	Professor	B.S., Michigan State University, 1973; M.S., 1974; M.B.A., University of Michigan, 1983; Ph.D., 1985.
Flushman, Tanya R. (2012) School of Education	Associate Professor	B.A., University of California, Santa Cruz, 1998; M.S., State University of New York, College at Buffalo, 2006; Ph.D., Vanderbilt University, 2012.
Fogle, Emily (2007) Chemistry and Biochemistry	Professor	B.A., Sonoma State University, 2000; Ph.D., University of California, Davis, 2005.
Folk, Elizabeth (2017) Art and Design	Assistant Professor	B.F.A., University of Colorado, Boulder, 2007; M.F.A., University of California, Santa Barbara, 2009.
Foroohar, Manzar (1987) History	Professor	B.A., National University of Iran; M.A., California State University, Northridge, 1973; Ph.D., University of California, Los Angeles, 1984.
Forster, Sophia (2008) English	Associate Professor	B.A., York University, 1998; M.A., University of Victoria, 2001; Ph.D., State University of New York at Buffalo, 2008.
Fowler, Thomas , IV (1995) Architecture	Professor	B.Arch., New York Institute of Technology/Old Westbury, 1984; M.Arch., Cornell University, 1994. Registered Architect, New York.
Foxen, Anya P. (2018) Philosophy	Assistant Professor	B.A., Rutgers, 2008; M.A., UCSB; 2011 PhD, UCSB, 2015
Frame, Samuel (2007) Statistics	Professor	B.S., California Polytechnic State University, San Luis Obispo, 2001; M.S., University of California, Santa Barbara, 2004; Ph.D., 2007.
Francis, Clinton D. (2013) Biological Sciences	Assistant Professor	B.S., Pacific University, 2002; M.A., University of Colorado 2007; Ph.D., 2010.
Frantz, Sara J. (2014) Art and Design	Associate Professor	B.S., University of Wisconsin-Madison, 2003; M.F.A., University of Texas, 2007.
Frantz, Derik K. (2014) Chemistry and Biochemistry	Assistant Professor	B.S. 2005 Juniata College, 2005; M.Sc. University of Zurich, Switzerland, 2008; Dr. sc. nat. University of Zurich, Switzerland, 2012.
Freberg, Laura A. (1987) Psychology and Child Development	Professor	B.A., University of California, Los Angeles, 1974; M.A., 1975; Ph.D., 1979.
Freed, Tali (2001) Industrial and Manufacturing Engineering	Professor	B.Sc., Technion-Israel Institute of Technology, Israel, 1983; M.Sc., 1988; Ph.D., University of California, Berkeley, 1995. Registered Professional Engineer, California.
Funston-Timms, Benjamin F. (2007) Social Sciences	Professor	B.A., University of New Mexico, 1997; M.A., Indiana University, 1999; Ph.D., 2007.
Galanti, Tera (2008) Art and Design	Associate Professor	B.F.A., California State University, Long Beach, 1986; M.F.A., 1995.
Galvan-Mandujano, Martha Carolina (2018) World Languages and Cultures	Assistant Professor	B.A., Texas A M University, 2000; M.A., Texas A M University, 2007; Ph.D., University of Oklahoma, 2015.
Garcia, Antonio F. (2001) Physics	Professor	B.A., University of California, Los Angeles, 1988; B.S., San Jose State University, 1994; M.S., The University of New Mexico, 1996; Ph.D., University of California, Santa Barbara, 2001.
Garcia, Julie A. (2007) Psychology and Child Development	Professor	B.A., California State University, San Bernardino, 1996; Ph.D., University of Michigan, Ann Arbor, 2005.
Garner, Lauren C. (2005) Horticulture and Crop Science	Professor	B.S., The College of William and Mary, 1992; M.S., Cornell University, 1996; Ph.D., University of California, Riverside, 2004.
Gearhart, Richard O. (2006) Journalism	Associate Professor	B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S., California Polytechnic State University, San Luis Obispo, 2009.
Gentilucci, James L. (2003) School of Education	Professor Emeritus	B.A., California State University, Northridge, 1980; M.A., California Polytechnic State University, San Luis Obispo, 1985; Ph.D., University of California, Santa Barbara, 2001.
Gharibyan, Hasmik (2000) Computer Science	Professor	M.S., Yerevan State University, Republic of Armenia, USSR, 1981; Ph.D., 1991.
Giberti, Bruno (1994) Architecture, Center for Teaching and Learning	Professor and Associate Vice Provost	B.S. Arch., California Polytechnic State University, San Luis Obispo, 1980; M.Arch., University of California, Berkeley, 1989; Ph.D., 1994; Registered Architect, California.

Gill, Samantha J. (1997) Natural Resources Management and Environmental Sciences, BioResource and Agricultural Engineering	Professor	B.S., Humboldt State University, 1991; M.S., 1993; Ph.D., University of California, Berkeley, 1997. Registered Professional Forester, California.
Gillen, Glen D. (2006) Physics	Professor	B.S., Denison University, 1994; M.S., Miami University, 1996; M.A.T., 1997; M.S., The Ohio State University, 2001; Ph.D., 2002.
Gillen, Katharina (2006) Physics	Professor	Vordiplom, Rheinische Friedrich-Wilhelms Universität Bonn, 1998; M.S., The Ohio State University, 2000; Ph.D., 2005.
Gillette, David (2001) English, Liberal Arts and Engineering Studies	Professor and LAES Co-Director	B.A., University of Iowa, 1985; M.A., University of New Mexico, 1992; Ph.D., 1995.
Glanz, Hunter S. (2014) Statistics	Assistant Professor	B.S., California Polytechnic State University, San Luis Obispo, 2009; M.A., Boston University, 2012; Ph.D., 2013.
Glick, Mary M. (2012) Journalism	Department Chair	B.A., State University of New York at Oswego, 1972; M.A., California State University, Fullerton, 1982.
Glysson, Scott (2017) Music	Assistant Professor	B.M., George Mason University, 2007; M.M., University of Arizona, Tucson, 2012; D.M.A., University of Arizona, Tucson, 2014.
Goel, Rakesh K. (1997) College of Engineering, Civil and Environmental Engineering	Associate Dean and Professor	B.Tech, Indian Institute of Technology, New Delhi, 1982; M.S., University of California, Berkeley, 1985; Ph.D., 1990. Registered Professional Engineer, California.
Goldenberg, Marni (2003) Experience Industry Management	Professor	B.S., California State University, Sacramento, 1995; M.S., Purdue University, 1997; Ph.D., University of Minnesota, 2002.
Goodman, Anya (2005) Chemistry and Biochemistry	Professor	B.S., Florida Atlanta University, 1996; Ph.D., Massachusetts Institute of Technology, 2003.
Gorman, Larry R. (1997) Finance	Professor	B.S., Washington State University, 1985; M.B.A., Western Washington University, 1988; Ph.D., Northwestern University, 1998.
Gragson, Derek E. (1999) College of Science and Mathematics, Chemistry and Biochemistry	Associate Dean and Professor	B.S., California State University, Hayward 1991; M.S., 1995; Ph.D., University of Oregon, 1997.
Granger, Brian E. (2008) Physics	Associate Professor	B.S., Westmont College, 1994; Ph.D., University of Colorado at Boulder, 2001.
Greenbaum, Bruce (2015) Management, HR, and Information Systems	Assistant Professor	B.S., University of Virginia, 1991; M.B.A., University of Michigan, 1996; Ph.D., University of Texas, 2013.
Greenwood, Jerusha B. (2006) Experience Industry Management	Associate Professor	B.S., University of Utah, 1998; M.S., 2002; Ph.D., North Carolina State University, 2006.
Greenwood, P. Brian (2006) Experience Industry Management	Associate Professor	B.A., University of North Carolina at Chapel Hill, 1996. M.S., North Carolina State University, 2001; Ph.D., 2007.
Greever, Cory J. (2016) Kinesiology	Assisant Professor	B.S., Virginia Commonwealth University, 2010; M.S., James Madison University, 2012; Ph.D. University of Massachusettes, Amherst, 2016.
Greig, Amelia (2016) Aerospace Engineering	Assistant Professor	B.S., University of Adelaide; Ph.D., The Australian National University
Greve, Adrienne I. (2006) City and Regional Planning	Professor	B.S., Cornell University, 1996; M.S., Colorado State University, Ft. Collins, 1999; Ph.D., University of Washington, Seattle, 2007.
Griffin, Lanny (1997) Biomedical Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1992; Ph.D., University of California, Davis, 1996.
Grossenbacher, Dena L. (2017) Biological Sciences	Assistant Professor	B.S., University of Washington, 1999; Ph.D., University of California, Davis, 2013.
Grundmeier, Todd A. (2004) Mathematics	Professor	B.S., University of New Hampshire, 1997; M.S., 2000; Ph.D., 2003.
Gu, Caixing (1998) Mathematics	Professor	B.S., Zhejiang University, 1982; M.S., China Textile University, 1986; Ph.D., Indiana University, 1994.
Guise, Megan (2009) School of Education	Professor	B.S., Millersville University, 2002; M.Ed., 2004; Ph.D., University of Pittsburgh, 2009.
Gutierrez, Thomas D. (2006) Physics	Professor	B.S., San José State University, 1991; M.S., 1994; Ph.D., University of California, Davis, 2000.

Haberland, Matthew D. (2018) BioResource and Agricultural Engineering	Assistant Professor	B.S., Cornell University, 2007; M.S. Mechanical Engineering, Cornell University, 2007; Ph.D., Massachusetts Institute of Technology, 2014.
Habib, Kenneth (2006) Music	Professor	B.A., University of California, Los Angeles, 1983; M.A., University of California, Santa Barbara, 1995; Ph.D., 2005.
Hackman, Christine L. (2015) Kinesiology	Assistant Professor	B.S., Rowan University, 2010; M.A., University of Alabama, 2012; Ph.D., University of Alabama, 2015.
Hagen, John (2001) Chemistry and Biochemistry	Professor	B.S., University of Nevada, Las Vegas, 1992; Ph.D., Stanford University, 1996.
Hagobian, Todd A. (2009) Kinesiology	Associate Professor	B.A., University of Southern California, 1991; M.A., San Francisco State University, 2002; Ph.D., University of Massachusetts at Amherst, 2007.
Hailer, Jason D. (2016) Construction Management	Assistant Professor	B.S., University of Phoenix, 1999; M.S., Arizona State University, 2002; Ph.D., Arizona State University, 2016.
Hajrasouliha, Amir (2015) City and Regional Planning	Assistant Professor	B.Arch., Shahid Beheshti University, 2004; M.Urbanism, University of Tehran, 2007; M. Urban Design, University of Michigan, 2011; Ph.D. Metropolitan Planning, Policy, and Design, University of Utah, 2015
Hall, Garrett J. (2002) Civil and Environmental Engineering	Professor	B.S., Worcester Polytechnic Institute, 1992; M.S., University of Washington, 1993; Ph.D., University of California, Berkeley, 2001. Registered Professional Engineer, California.
Hall, Kellie Green (1990) College of Science and Mathematics, Kinesiology	Associate Dean and Professor	B.S., Rocky Mountain College, 1977; M.S., Eastern Washington University, 1977; Ph.D., Louisiana State University, 1990.
Hamilton, Lynn (1996) Agribusiness	Professor	B.S., Ohio State University, 1988; M.S., University of Minnesota, 1995; Ph.D., 1996.
Hamilton, Margaret E. (2012) Mathematics	Professor	B.S., University of Chicago 1989; M.A., University of California, Los Angeles, 1991; Ph.D., 1995.
Hamilton, Stephen (2004) Economics	Professor	B.A., University of California, Santa Barbara, 1991; M.S., University of California, Berkeley, 1994; Ph.D., 1996.
Hampsey, John C. (1992) English	Professor	B.A., Holy Cross College, 1976; Ph.D., Boston College, 1982.
Hanson, James L. (2005) Civil and Environmental Engineering	Professor	B.S., University of Wisconsin, Madison, 1990; M.S., University of Minnesota, Minneapolis, 1992; Ph.D., University of Wisconsin, Madison, 1996. Registered Professional Engineer, California and Wisconsin.
Harding, Trevor S. (2006) Materials Engineering	Professor and Department Chair	B.S., University of Michigan, 1995; M.S., 1997; Ph.D., 2000.
Hardy, Kristina (2011) Biological Sciences	Associate Professor	B.S., Tulane University, 2003; Ph.D., University of North Carolina Wilmington, 2009.
Hatch, Ryan (2014) English	Assistant Professor	B.A., Kalamazoo College, 2004; M.A., State University of New York, 2008; Ph.D., State University of New York, 2013.
Hauck, Allan J. (2002) Construction Management	Professor and Department Head	B.A., Kalamazoo College, 1973; M.Ed., Bowling Green State University, 1979; Ph.D., University of Maryland, 1990. Certified Professional Constructor (CPC).
Haungs, Michael L. (2003) Computer Science; Liberal Arts and Engineering Studies	Professor and LAES Co-Director	B.S., University of California, Berkeley, 1992; M.S., Clemson University, 1998; Ph.D., University of Davis, 2002.
Hawkins, Ben (2016) Biomedical Engineering, Electrical Engineering	Assistant Professor	B.S., California State University, Fresno, 2005; Ph.D., Cornell University, Ithaca, 2010.
Hazelwood, Scott (2007) Biomedical Engineering	Professor	B.S., Harvey Mudd College, 1985; M.E., 1986; M.S., University of California, Davis, 1992; Ph.D., 1998.
Headrick, David H. (1998) Horticulture and Crop Science	Professor	B.S., California State Polytechnic University, Pomona, 1986; M.S., University of California, Riverside, 1988; Ph.D., 1992. Pest Control Advisor, California.
Healy, Brian P. (2017) Theatre and Dance	Assistant Professor	B.A., Truman State University, 1996; M.F.A., University of Washington, 2007.
Helmbrecht, Brenda (2004) English	Professor	B.A., Truman State University, 1997; M.A., Miami University, 1999; Ph.D., 2004. Director of Writing.

Helms, Eleanor D. (2011) Philosophy	Associate Professor	B.A., Wheaton College, 2002; M.A., Fordham University, 2007; Ph.D., 2011.
Hendricks, William W. (1994) Experience Industry Management	Professor	B.A., California State University, Chico, 1980; M.B.P.A., John F. Kennedy University, 1984; Ph.D., University of Utah, 1993.
Hendricks, Karin (2018) Theatre and Dance	Assistant Professor	B.A. University of Arizona, 2004; M.F.A., University of California, Irvine, 2009.
Hess, Jeffrey (2007) Marketing	Associate Professor	B.A., Biola University, 1986; M.B.A., Pepperdine, 1988; Ph.D., University of Colorado-Boulder, 1998.
Heylman, Christopher M. (2017) Biomedical Engineering	Assistant Professor	B.S., California Polytechnic State University, San Luis Obispo, 2007; Ph.D., Case Western Reserve University, 2013.
Higgins, Lindsey M. (2012) Agribusiness	Associate Professor	B.S., California Polytechnic State University, San Luis Obispo, 2002; M.S., Texas AM University, 2005; Ph.D., 2009.
Hill, Margarita M. (2005) Landscape Architecture	Professor	B.S.L.A., University of California, Davis, 1986; M.S.C.D., 1989.
Hill, Alessandro (2018) Industrial and Manufacturing Engineering	Assistant Professor	B.S. and M.S., University of Augsburg, Germany, 2006; Ph.D., University of Hamburg, Germany, 2016.
Hillers, Kenneth J. (2004) Biological Sciences	Professor and Department Chair	B.S., Western Washington University, 1980; Ph.D., University of Oregon, 1998.
Hiltpold, Paul (1989) History	Professor	B.A., University of Texas, 1974; M.A., 1976; Ph.D., 1981.
Himelblau, Edward T. (2005) Biological Sciences	Professor	B.S., University of California San Diego, 1992; Ph.D., University of Wisconsin, 2000.
Hoellwarth, Chance (1997) Physics	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S., University of California, Davis, 1994; Ph.D., 1997.
Holtzapple, Robert (2008) Physics	Professor	B.A., University of California, Berkeley, 1988; M.S., Stanford University, 1991; Ph.D., 1996.
Hoover, Benjamin K. (2013) Horticulture and Crop Science	Assistant Professor	B.S., Temple University, 2005; M.S., The Pennsylvania State University, 2007; Ph.D., 2012
Hopper, Matthew S. (2006) History	Professor	B.A., Pepperdine University, 1996; M.A., Temple University, 1998; M.A., University of California, Los Angeles, 2000; Ph.D., 2006.
Horney, Marc R. (2009) Animal Science	Associate Professor	B.S., California Polytechnic State University, San Luis Obispo, 1990; M.S., Oregon State University, 1992; Ph.D., University of Nebraska-Lincoln, 1999.
Howard, Wayne H. (1999) Agribusiness	Professor	B.A., California State University, 1974; M.Sc., University of Florida, 1982; Ph.D., Texas AM University, 1987.
Howe, Patrick C. (2011) Journalism	Associate Professor	B.A., University of Minnesota, 1993; M.A., University of Missouri-Columbia, 2011.
Howes, Daniel J. (2011) BioResource and Agricultural Engineering	Associate Professor	B.S., University of California, Davis, 1997; M.S., California Polytechnic State University, San Luis Obispo, 2001; Ph.D., University of California, Irvine, 2010. Registered Professional Engineer, California..
Hughes, Gary B. (2008) Statistics	Assistant Professor	B.A., Northwestern University, 1986; M.A., University of California, Santa Barbara, 1992; Ph.D., University of Pennsylvania, 1999.
Hurley, Sean P. (2002) Agribusiness	Professor	B.A., University of San Francisco, 1994; Ph.D., Iowa State University, 2000.
Hurt, Shelley L. (2008) Political Science	Associate Professor	B.A., University of California, Berkeley, 1995; M.A., New School for Social Research, New York, 2001; Ph.D., 2010.
Huzzey, Julianna M. (2014) Animal Science	Assistant Professor	B.S., University of British Columbia, 2003; M.S., University of British Columbia, 2007; Ph.D., Cornell University, 2012.
Immoos, Chad E. (2004) Chemistry and Biochemistry	Professor	A.B., Occidental College, 1996; Ph.D., University of California, Irvine, 2002.
Inchausti, Robert L. (1984) English	Professor	B.A., California State University, Sacramento, 1974; M.A., 1976; Ph.D., University of Chicago, 1981.
Iscold, Paulo (2018) Aerospace Engineering	Associate Professor	B.S., Universidade Federal de Minas Gerais, 1999; M.S., Universidade Federal de Minas Gerais 2001; Ph.D., Universidade Federal de Minas Gerais 2004
Isom, Denise A. (2008) Ethnic Studies	Professor and Department Chair	B.S., B.A., University of California, Davis, 1989; M.A., 1992; Ph.D., Loyola University, Chicago, 2003.

Jackson, Douglas (2008) Architecture	Professor	B.Arch., Virginia Polytechnic Institute and State University, 1993; M.Arch, Princeton University, 2000. Registered Architect, California.
Jackson, Lorraine D. (1992) Communication Studies	Associate Professor	B.A., University of Western Ontario, 1987; M.A., Pennsylvania State University, 1989; Ph.D., 1992.
Jafari, Roy (2018) Industrial and Manufacturing Engineering	Assistant Professor	B.S., Tafresh University, Iran, 2010; M.S., University of Tehran, Iran, 2014; Ph.D., Mississippi State University, 2018.
Jaggia, Sanjiv (2007) Orfalea College of Business, Economics, Finance	Associate Dean and Professor	B.A., Panjab University, India, 1981; Ph.D., Indiana University, Bloomington, 1990.
James, Jonathan (2013) Economics	Assistant Professor	B.A., UCLA, 2003; M.A., Duke University, 2007; Ph.D., Duke University, 2011.
Jankovitz, Kristine Z. (1996) Kinesiology	Professor and Department Chair	B.S., California Polytechnic State University, San Luis Obispo, 1984; M.S., 1989; Ph.D., University of Nebraska-Lincoln, 1995. Graduate Coordinator.
Jansen, Daniel (2003) Civil and Environmental Engineering	Professor	B.S., University of California, San Diego, 1988; Ph.D., Northwestern University, 1996. Registered Professional Engineer, California.
Janzen, David S. (2006) Computer Science	Professor	B.A., Tabor College, 1990; M.S., University of Kansas, 1993; Ph.D., 2006.
Jasbinsek, John J. (2008) Physics	Associate Professor	B.S., California State Polytechnic University, Pomona, 1992; M.A., University of California, Santa Barbara, 1994; Ph.D., University of Wyoming, 2008.
Jeffery, Elizabeth (2017) Physics	Assistant Professor	B.S., Brigham Young University, 2003; M.S. University of Texas at Austin, 2005; Ph.D., University of Texas at Austin, 2009.
Jenkins, Ryan (2015) Philosophy	Assistant Professor	B.A., Florida State University, 2009; Ph.D., University of Colorado, 2014.
Jensen, Jessica L. (2017) School of Education	Assistant Professor	B.A., University of Iowa, 2008; M.A., Viterbo University, La Crosse, 2010; Ph.D., University of Iowa, 2017.
Jin, Xiaomin (2004) Electrical Engineering	Professor	B.S., Tsinghua University, Beijing, China, 1992; M.S., 1996; Ph.D., University of Illinois at Urbana-Champaign, 2001.
Jipson, Jennifer (2005) Psychology and Child Development	Professor	B.A., Smith College, 1993; M.S., University of California, Santa Cruz, 1996; Ph.D., 2000.
Johnston, Scott C. (2008) Physics	Associate Professor	B.S., Stanford University, 1999; M.S., 2000; Ph.D., University of California, Santa Barbara, 2006.
Johnston, Liz B. (2010) Social Sciences	Assistant Professor	B.S., Winthrop College, SC, 1978; M.S.W., Smith College, 1984; Ph.D., Smith College, 2013.
Jones, Barry K. (2001) Construction Management	Professor	M.Sc., University of Aston, U.K., 1980; Ph.D., University of Southampton, U.K., 1999. Chartered Builder (FCIOB); Fellow American Society of Civil Engineers, Senior Fulbright Scholar.
Jones, Dane R. (1976) Chemistry and Biochemistry	Professor	B.A., University of Utah, 1969; Ph.D., Stanford University, 1974.
Jones, Eric (2012) Chemistry and Biochemistry	Assistant Professor	B.S., Case Western Reserve University, Cleveland, 2000; Ph.D., 2006
Jones, R. Thomas (2003) Architecture	Professor Emeritus	B.Arch., Cornell University, 1969. AIA, Registered Architect, California.
Jones, Terry L. (1998) Social Sciences	Professor and Department Chair	B.A., University of California, Santa Cruz, 1978; M.A., Sonoma State University, 1982; M.A., University of California, Davis, 1989; Ph.D., 1995.
Jovanovic, Jasna (2005) Psychology and Child Development	Professor and Department Chair	B.S., University of Illinois, 1985; M.S., Pennsylvania State University, 1987; Ph.D. 1991.
Jung, Stephanie (2014) Food Science and Nutrition	Professor	B.S., University of Sciences, Metz, France, 1995; M.S., National Polytechnic Institute of Lorraine, Nancy, France, 1996; Ph.D., National School for Engineers in Agricultural and Food Science, Nantes, France, 2000.
Kabaker, Russ (2014) College of Agriculture, Food and Environmental Sciences	Assistant Dean	B.S., California Polytechnic State University, San Luis Obispo, 1994.
Kachlakev, Damian I. (2000) Civil and Environmental Engineering	Professor	B.S., University of Architecture, Civil Engineering and Geodesy, Sofia, Bulgaria, 1986 and 1988; M.S., 1988; Ph.D., Oregon State University, Corvallis, 1997. Registered Professional Engineer, Bulgaria.

Kaczorowski, Jessica (2017) Psychology and Child Development	Assistant Professor	B.A., University of California, San Diego, 2005; M.A., University of North Carolina at Greensboro, 2008; Ph.D., 2012.
Kane, Steven (1994) School of Education	Professor Emeritus	B.A., California State Polytechnic University, Pomona, 1985; M.A., University of California, Los Angeles, 1989; Ph.D., 1993. Licensed Psychologist, California.
Kang, Iksoon (2016) Animal Science	Associate Professor	B.S., Kon-Kuk University, Seoul, Korea, 1988; M.S., California State University, Fresno, 1991; Ph.D., Texas A M University, 1996.
Kann, David J. (1969) English	Professor	B.A., Brandeis University, 1964; M.A., New York University, 1966; Ph.D., Occidental College, 1971. Postdoctoral study, State University of New York, Buffalo; M.F.A., Vermont College of Fine Arts; Ph.D., 2009.
Kantorowski, Eric J. (2004) Chemistry and Biochemistry	Professor	B.S., California State University, Fullerton, 1993; Ph.D., University of California, Davis, 1998.
Kasper, Eric P. (1997) Civil and Environmental Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1991; M.S., University of California, Davis, 1992; Ph.D., University of California, Berkeley, 1997. Registered Professional Engineer, California.
Kathuria, Ajay (2014) Industrial Technology and Packaging	Assistant Professor	B.S., GJUST, India, 2002; M.S., Michigan State University, 2007; Ph.D., Michigan State University, 2013.
Kato, Goro C. (1981) Mathematics	FERP	B.S., Shizuoka University, Japan, 1972; M.A., West Virginia University, 1974; Ph.D., University of Rochester, 1979.
Katona, Thomas M. (2014) Biomedical Engineering	Assistant Professor	B.S., Westmont College, 1996; M.S., University of California, Santa Barbara, 2000; Ph.D., University of California Santa Barbara, 2003; M.B.A., University of South Carolina, 2007.
Kauffmann, Krista J. (2012) English	Professor	B.A., Goshen College, 1999; M.A., University of Wisconsin-Madison, 2001; Ph.D., 2009.
Kaul, Anton (2003) Mathematics	Professor	B.S., University of California, Davis, 1994; M.S., Oregon State University, 1996; Ph.D., 2000.
Keadle, Sarah K. (2016) Kinesiology	Assistant Professor	B.S., Lake Forest University, 2006; M.S., University of Massachusetts, Amherst, 2008; Ph.D., University of Massachusetts, Amherst, 2012; MPH, Harvard School of Public Health, 2013.
Kean, Andrew J. (2004) Mechanical Engineering	Professor	B.E., The Cooper Union, 1997; M.S., University of California, Berkeley, 1999; Ph.D., 2003.
Kearns, Timothy J. (1985) Computer Science	Associate Professor	B.A., Boston College, 1969; M.S., University of Notre Dame, 1970; Ph.D., 1976.
Keeling, Elena L. (1997) Biological Sciences	Professor	B.S., Yale University, 1989; Ph.D., University of California, San Francisco, 1996.
Keen, Aaron W. (2002) Computer Science	Professor	B.S., University of California, Davis, 1997; M.S., 2000; Ph.D., 2002.
Keese, James R. (2003) Social Sciences	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1987; M.A., American Graduate School of International Management, 1989; Ph.D., University of Arizona, 1996.
Keesey, Douglas (1988) English	Professor	B.A., University of California, Berkeley, 1982; M.A., 1984; Ph.D., Princeton University, 1988.
Keif, Malcolm G. (1989) Graphic Communication	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1986; M.A., California State University, Long Beach, 1989; Ph.D., University of Missouri, 1995.
Keim, Nathan C. (2014) Physics	Assistant Professor	B.S., Haverford College, 2004; Ph.D., University of Chicago, 2010.
Keller, John M. (2006) Physics	Professor	B.S., Stanford University, 1991; M.A., 1992; M.S., University of Colorado, Boulder, 1999; Ph.D., University of Arizona, 2006.
Kelting, Scott D. (2007) Construction Management	Professor	B.S., California Polytechnic State University, San Luis Obispo, 2000; M.S., 2003; Ed.D., University of California Santa Barbara, 2011. Certified Green Professional (CGP), Certified Aging-in-Place Specialist (CAPS), LEED Accredited Professional (LEED AP).
Kelting, Mary (2012) Orfalea College of Business	Assistant Dean	B.A., University of Massachusetts Amherst, 1996; M.B.A., Pepperdine University, 2001.

Kennelly, Brian (2006) World Languages and Cultures	Professor	B.A., University of California, Davis, 1986; M.A., University of Virginia, 1989; Ph.D., New York University, 1996.
Khosmood, Foaad (2011) Computer Science, Computer Engineering	Associate Professor	B.S., California Polytechnic State University, San Luis Obispo, 1999; M.S., 2005; Ph.D., University of California, Santa Cruz, 2011.
Kingsbury, Kevin B. (1996) Chemistry and Biochemistry	Professor	B.S., College of William and Mary, 1986; Ph.D., Stanford University, 1993.
Kirk, Colleen M. (2001) Mathematics	Professor	B.S., Stanford University, 1994; M.S., Southern Illinois University, Carbondale, 1995; Ph.D., Northwestern University, 1999.
Kiste, Alan L. (2011) Chemistry and Biochemistry	Associate Professor	B.S., Calvin College, 1993; Ph.D., University of Michigan, 2009.
Kitts, Christopher L. (1995) Biological Sciences	Professor	B.Sc., University of Auckland, New Zealand, 1984; Ph.D., University of California, Santa Cruz, 1992.
Klay, Jennifer L. (2006) Physics	Professor	B.S., University of California, Los Angeles, 1994; M.S., University of California, Davis, 1998; Ph.D., 2001.
Klisch, Stephen M. (2001) Mechanical Engineering	Professor	B.S., University of Virginia, 1991; M.S., 1994; Ph.D., University of California, Berkeley, 1999.
Knight, Charles A. (2003) Biological Sciences	Professor	B.S., Western Washington University, 1996; Ph.D., Stanford University, 2002.
Kolegraff, Stacy (2009) Construction Management	Assistant Professor	B.S., California Polytechnic State University, San Luis Obispo, 2002; M.A. Management, University of Redlands School of Business 2008.
Kolkailah, Faysal A. (1984) Aerospace Engineering	Professor	B.S., Cairo University, Egypt, 1969; M.S., University of Cincinnati, 1978; Ph.D., Louisiana State University, 1982; additional graduate study, Cairo University. Registered Professional Engineer, Egypt.
Kolluru, Gita R. (2008) Biological Sciences	Professor	B.Sc., Queen's University, Kingston, Canada, 1991; M.A., University of California, Riverside, 1994; Ph.D., 1999.
Kolodziejski, Laruen R. (2014) Communication Studies	Assistant Professor	B.A., B.S., Winthrop University, 2004; M.A., University of Colorado, Boulder, 2010; Ph.D., University of Washington, 2014.
Kravets, Robert (2014) Food Science and Nutrition	Associate Professor	B.S., Microbiology, University of Illinois, Urbana-Champaign, 1978; M.S., Food Science (Processing), University of Illinois, 1982; Urbana-Champaign; Ph.D., Food Science and Technology, Virginia Polytechnic Institute and State University, 1989.
Krifka, Laura (2018) Art and Design	Assistant Professor	B.F.A., California Polytechnic State University, San Luis Obispo, 2008; M.F.A., University of California, Santa Barbara, 2010.
Kuhn-Choi, Don H. (2003) Architecture	Professor	A.B., Princeton University, 1988; M.Arch., Rice University, 1993; Ph.D., U.C. Berkeley, 2003.
Kurfess, Franz J. (2000) Computer Science	Professor	M.S., Technical University of Munich, 1984; Ph.D., 1990.
Kuriabova, Tatiana (2014) Physics	Assistant Professor	Honors Diploma in Physics, Ivanovo State University, Ivanovo, Russia, 1996; M.S., University of California, Los Angeles, 2001; Ph.D., 2008.
La Frano, Michael (2016) Food Science and Nutrition	Assistant Professor	B.S. Loma Linda University, 2007; Ph.D. University of California, Davis, 2012.
Laiho, Lily (2007) Biomedical Engineering	Professor	B.S., Stanford University, 1995; M.S., 1996; Ph.D., Massachusetts Institute of Technology, 2004.
Lambertz-Berndt, Megan M. (2015) Communication Studies	Assistant Professor	B.A., Delaware State University, 2009; M.A., University of Nevada Las Vegas, 2011; Ph.D., University of Wisconsin-Milwaukee, 2016.
Lammert, Amy (2008) Food Science and Nutrition	Associate Professor	B.S., Michigan State University, 1991; M.S., University of Illinois, 1993; Ph.D., 1997.
Lange, John H. (1975) Architecture	Professor Emeritus	B.S., University of Cincinnati, 1968; M.Arch., Stanford University, 1972; Ph.D., University of Pennsylvania, 1975. Registered Architect, California.
Lange, Karen F. (1989) Architecture	Professor	B.Arch., California Polytechnic State University, San Luis Obispo, 1980; M.Arch., Columbia University, 1982. Registered Architect, California.
Langner, Carrie A. (2008) Psychology and Child Development	Professor	B.A., University of Michigan, 1997; Ph.D., University of California, Berkeley, 2005.
LaPorte, Mary L. (1985) Art and Design	Professor Emeritus	B.A., Washington State University, 1975; M.F.A., 1980.

Lathrop, Amanda A. (2009) Food Science and Nutrition	Associate Professor	B.S., California Polytechnic State University, San Luis Obispo, 1999; M.S., Purdue University, 2002; Ph.D., 2005.
Latner, Michael (2008) Political Science	Associate Professor	B.A., California State University, Chico, 1995; M.A., University of California, Irvine, 2006; Ph.D., 2008.
Laursen, Peter T. (2007) Architectural Engineering	Professor	M.S., University of California, San Diego; Ph.D., University of Auckland, New Zealand, 2003. Registered Civil Engineer, California.
Laver, Gary D. (1998) Psychology and Child Development	Professor	B.A., University of California, Santa Cruz, 1983; M.A., Claremont Graduate University, 1987; Ph.D., 1992.
Lawler, Brian P. (2007) Graphic Communication	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1976; M.S., 2006.
Lawson, John W. (2009) Architectural Engineering	Associate Professor	B.S., California Polytechnic State University, San Luis Obispo, 1983; M.S., Stanford University, 1986. Registered Structural Engineer and Civil Engineer, California, Arizona.
Lazcano, Cristina (2016) Natural Resources Management and Environmental Sciences	Assistant Professor	B.S., University of Santiago de Compostela, 2003; M.S., University of Vigo, 2005; Ph.D., University of Vigo, 2009.
Lecat, Benoit (2015) Wine and Viticulture	Professor and Department Head	M.S., Graduate School of Business Students, KULeuven, Belgium, 2000; Ph.D., FUCAM, branch of LOUVAIN School of Management, UCL Campus of Mons, Belgium, 2006. Level 4 DipWSET
Lee, Linda (2009) Psychology and Child Development	Associate Professor	B.A., University of California, Los Angeles, 1999; M.Ed., Harvard Graduate School of Education, 2000; Ph.D., University of California, Los Angeles, 2007.
Lee, Jean L. (2014) Materials Engineering	Associate Professor	S.B., Massachusetts Institute of Technology, 1988; Ph.D. Cornell University, 1996.
Lehr, Corinne (2006) Chemistry and Biochemistry	Professor	B.Sc., University of Calgary, 1994; Ph.D., University of British Columbia, 2003.
Lehr, Jane L. (2007) Ethnic Studies, Women's and Gender Studies	Professor	B.A., University of Rochester, 1997; M.S., Virginia Polytechnic Institute and State University, 2002; Ph.D., 2006.
Leithner, Anika (2006) Political Science	Professor	Vordiplom, Friedrich-Alexander-Universität Erlangen-Nuremberg, Germany, 1999; M.A., University of Colorado, 2002; Ph.D., 2006.
Lema, Sean C. (2011) Biological Sciences	Associate Professor	B.S., University of California, Davis, 1999; M.S., 2001; Ph.D., 2004.
Lemieux, Patrick (2007) Mechanical Engineering	Professor	B.Sc.Eng., University of New Brunswick, Fredericton, Canada, 1991; M.Sc., Cranfield Institute of Technology, Bedford, England, 1992; Ph.D., California Institute of Technology, 1999.
Lepore, Jason (2007) Economics	Professor	B.A., University of California, Irvine, 2002; M.A., University of California, Davis, 2003; Ph.D., 2007.
Lertwachara, Kevin (2004) Management, HR, and Information Systems	Professor	B.S., King Monkut's Institute of Technology, Thonburi, Bangkok, Thailand, 1994; M.B.A., Westminster College, 1996; Ph.D., University of Connecticut, 2004.
Levi, Daniel J. (1982) Psychology and Child Development	Professor	B.A., Lehigh University, 1973; M.S., University of Arizona, 1979; Ph.D., 1981.
Liese, Jeffrey E. (2008) Mathematics	Associate Professor	B.S., California Polytechnic State University, San Luis Obispo, 2000; M.A., University of California, San Diego, 2004; Ph.D., 2008.
Lin, Patrick (2007) Philosophy	Professor	B.A., University of California, Berkeley, 1990; M.A., University of California, Santa Barbara, 1995; Ph.D. 1997.
Lin, Joyce T. (2013) Mathematics	Assistant Professor	B.A., University of Virginia, 2004; Ph.D., University of North Carolina at Chapel Hill, 2009.
Lin, Kevin (2014) Experience Industry Management	Assistant Professor	B.A., Beijing International Studies University, 2008; M.A., California State University, Chico; Ph.D., Pennsylvania State University, 2014.
Lindsey-Mulliken, Joan M. (2007) Marketing	Professor	B.S., University of Missouri, 1983; M.B.A., University of Arizona, 1996; Ph.D., 1999.
Liu, Bo (2014) BioResource and Agricultural Engineering	Assistant Professor	B.S., Northeastern University, China, 2009; M.S., Colorado State University, Pueblo, 2011; M.S., University of Missouri, Columbia, 2013; Ph.D., University of Missouri, Columbia, 2014.

Livingston, Peter A. (2016) BioResource and Agricultural Engineering	Professor and Department Head	B.S., University of Arizona, 1981; MS, Colorado State University, 1982; PhD, University of Arizona 2013. Registered Agricultural Engineer, AZ.
Liwanag, Heather (2015) Biological Sciences	Assistant Professor	B.S., University of California, San Diego, 2001; Ph.D., University of California, Santa Cruz, 2008.
Lloyd-Moffett, Stephen (2005) Philosophy	Professor	B.A., Claremont McKenna College, 1994; M.Th., St. Vladimir's Orthodox Seminary, 2004; M.A., University of California, Santa Barbara, 2001; Ph.D., 2005.
Loberg, Molly J. (2007) History	Professor	B.A., Pacific Lutheran University, 1998; M.A., Princeton University, 2002; Ph.D., 2006.
Locascio, James Gaspare (1981) Mechanical Engineering	Associate Professor	B.S., Newark College of Engineering, 1970; M.S., University of California, Santa Barbara, 1971; Ph.D., 1988.
London, Blair (1993) Materials Engineering	Professor	B.S., Drexel University, 1981; M.S., Stanford University, 1983; Ph.D., 1986.
Long, Todd (2004) Philosophy	Professor	B.A., University of Southern Mississippi, 1986; M.A., 1995; M.A., University of Wales, 2000; M.A., University of Rochester, 2002; Ph.D., 2003.
Lopus, Sara E. (2017) Social Sciences	Assistant Professor	B.S., University of California, Berkeley, 2005; M.S., University of California, Davis, 2009; Ph.D., University of California, Berkeley, 2015.
Lowham, Elizabeth A. (2007) Political Science	Professor and Department Chair	B.A., Carlton College, 2001; M.A., University of Colorado, 2003; Ph.D., 2007.
Lucas, Michael Austin (1998) Architecture	Professor Emeritus	B.A., Brown University, 1997; M.Arch., University of California, Los Angeles, 2003. Registered Architect, New Jersey.
Lund, Ulric J. (2001) Statistics	Professor	B.S., University of California, San Diego, 1990; M.S., University of California, Santa Barbara, 1993; Ph.D., 1998.
Lundquist, Tryg J. (2006) Civil and Environmental Engineering	Professor	B.A., University of California, Berkeley, 1989; M.S., 1992; Ph.D., 2006. Registered Civil Engineer, California.
Lupo, Christopher (2008) Computer Engineering, Computer Science	Associate Professor and Department Chair	B.S., California State University, Fresno, 1997; M.S., University of California, Davis, 2007; Ph.D., 2008.
Lynch, Joseph (2001) Philosophy	Professor	B.A., Virginia Commonwealth University, 1982; M.A., Claremont Graduate School, 1985; Ph.D., 1989.
Ma , Ruoxi (2018) Graphic Communication	Assistant Professor	B.S., Qingdao University of Science of Technology, 2010; M.S., Xi'an University of Technology, 2012; Ph.D., Western Michigan University - Kalamazoo, 2018.
Maber, David A. (2016) Accounting	Associate Professor	B.C., University of British Columbia, 2002; Ph.D., Harvard, 2009.
MacCarley, Arthur Carl (1988) Electrical Engineering	Professor	B.S., University of California, Los Angeles, 1976; M.S., 1978; Ph.D., Purdue University, 1987; Registered Professional Engineer, Colorado.
MacDougall, Neal A. (1997) Agribusiness	Associate Professor	B.A., Williams College, 1984; Ph.D., University of California, Berkeley, 1999.
Macedo, Jose (2002) Industrial and Manufacturing Engineering	Professor	B.S., Catholic University of Peru, Peru, 1982; M.S., University of California, Berkeley, 1984; Ph.D., Lehigh University, 1991. Registered Professional Engineer, Texas.
Machamer, Joshua T. (2003) Theatre and Dance	Professor and Department Chair	B.A., Whittier College, 1993; M.F.A., Pennsylvania State University, 2000.
Mackin, Thomas J. (2005) Mechanical Engineering	Professor	B.S., The Pennsylvania State University, 1980; M.S., 1987; Ph.D., 1991.
Macro, Kenneth L. (2000) Graphic Communication	Professor and Department Chair	B.A., Pennsylvania State University, University Park, 1993; M.A., The University of Akron, 2000; Ph.D., Walden University, 2011.
Maddren, Jesse (1999) Mechanical Engineering	Professor	B.S., University of California, Santa Barbara, 1985; M.S., 1988; Ph.D., 1994. Registered Professional Engineer, California.
Mahadev, Sthanu (2016) Mechanical Engineering	Assistant Professor	B.S., Anna University, Chennai India, 2008, M.S., The University of Texas at Arlington, 2011, Ph.D., 2015.
Main, Kelly D. (2007) City and Regional Planning	Associate Professor	B.A., University of California, Davis, 1982; M.A., Brown University, 1983; Ph.D., University of California, Los Angeles, 2007.

Malama, Bwalya (2014) Natural Resources Management and Environmental Sciences	Associate Professor	B.S., University of Arizona, 1999; M.S., University of Arizona, 2001; Ph.D., University of Arizona, 2006.
Malcom, Lorna A. (2016) College of Architecture and Environmental Design	Assistant Dean	B.A., Social and International Studies, State University of New York, Buffalo, 1992; Master of Public Administration, Bernard M. Baruch College, 1999; Master of International Relations, Long Island University, 1999.
Manjarin, Rodrigo (2015) Animal Science	Assistant Professor	D.V.M., University of Leon, Spain, 2004; M.S., Michigan State University, 2008; Ph.D., 2011; Ph.D., University of Leon Veterinary School, 2013.
Marchbanks, Paul (2007) English	Professor	B.S., Centre College of Kentucky, 1993; M.A., University of North Carolina at Chapel Hill, 2000; Ph.D., 2006. Graduate Director.
Marijuan, Silvia (2015) World Languages and Cultures	Assistant Professor	Licenciatura en Letras, University of Buenos Aires, 2009; M.S., Georgetown University, 2012; Ph.D., 2015.
Marlier, John F. (1981) Chemistry and Biochemistry	Professor	B.S., University of Wisconsin, Stevens Point, 1972; Ph.D., University of Wisconsin, Madison, 1978.
Marlow, Michael L. (1988) Economics	Professor	B.A., George Washington University, 1975; Ph.D., Virginia Polytechnic Institute, 1978.
Marlow (Buchanan), Colleen A. (2014) Physics	Assistant Professor	B.S., California Polytechnic State University, San Luis Obispo, 1999; Ph.D., University of Oregon, 2005.
Marshall, David D. (2004) Aerospace Engineering	Professor and Department Chair	B.S., Worcester Polytechnic Institute, 1994; M.S., Georgia Institute of Technology, 1995; Ph.D., 2003.
Martin, Kathleen J. (2002) Ethnic Studies	Professor	B.A., California State University, Northridge, 1992; M.A., University of California, Santa Barbara, 1993, 1996; Ph.D., 1997.
Martinez, Andres W. (2010) Chemistry and Biochemistry	Associate Professor	B.S., Stanford University, 2003; Ph.D., Harvard University, 2009.
Martinez, Charmaine (2006) Art and Design	Associate Professor	B.F.A., University of Notre Dame, 1993; M.F.A., University of Wisconsin-Madison, 2003.
Martinez, Nathaniel W. (2013) Biological Sciences	Assistant Professor	B.S., University of California, Santa Cruz, 2002; Ph.D. Cornell University, 2010; M.D., 2012.
Mase, Tom (2007) Mechanical Engineering	Professor	B.S.M.E., Michigan State University, 1980; M.S.M.E., University of California, Berkeley, 1982; Ph.D., 1987.
Mastoridis, Themistoklis (2013) Physics	Assistant Professor	B.S., Brandeis in Physics, 2003; M.S., Stanford University in Electrical Engineering, 2005; Ph.D. Stanford University in Electrical Engineering, 2010.
McCormick, Kathryn E. (2003) Art and Design	Professor	B.S., University of Cincinnati, 1996; M.S., 2001.
McCullough, Michael P. (2008) Agribusiness	Associate Professor	B.S., Boise State University, 2003; M.S., Washington State University, 2007; Ph.D., 2008.
McDaniel, Cole C. (2005) Architectural Engineering	Professor	B.S., University of California, San Diego, 1996; M.S., 1997; Ph.D., 2002. Registered Civil Engineer, California.
McDonald, Ashley (2013) Chemistry and Biochemistry	Associate Professor	B.S., Mississippi College, 2004; Ph.D. Georgia Institute of Technology, 2009
McDonald, Margot K. (1992) Architecture	Professor and Department Head	B.A., B.S., University of California, Santa Barbara, 1980; M.Arch., University of Oregon, 1987. AIA, Registered Architect, Oregon. NCARB Certificate.
McFarlane, Zach D. (2018) Animal Science	Assistant Professor	B.S., University of Arizona, 2013; M.S., University of Arizona, 2015; Ph.D., University of Tennessee, Knoxville, 2018.
McGaughey, Karen J. (2003) Statistics	Professor	B.A., Kansas State University, 1991; M.S., 1999; Ph.D., 2003.
McLamore, Alyson (1991) Music	Professor and Curriculum Committee Chair	B.A., University of California at Los Angeles, 1982; M.A., 1985; Ph.D., 1991.
McNeil Chand, Christina J. (2012) Theatre and Dance	Associate Professor	B.F.A., Cornish College of the Arts, 2000; M.F.A., University of Washington, 2012.
McQuaid, Patricia (1996) Management, HR, and Information Systems	Professor	B.S., Case-Western Reserve University, 1978; M.B.A., Eastern Michigan University, 1982; M.S., Auburn University, 1988; Ph.D., Auburn University, 1996.
Meagher, James M. (1988) Mechanical Engineering	Professor	B.S., University of Akron, 1978; M.S., 1981; Ph.D., University of California, Berkeley, 1987.

Mealy, Bryan J. (2003) Electrical Engineering, Computer Engineering	Associate Professor	B.S., California Polytechnic State University, San Luis Obispo, 1990; M.S., 1993; M.S., University of California, Santa Cruz, 1999; Ph.D., 2002.
Medina, Elsa (2000) Mathematics	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1994; M.S., 1996; Ph.D., University of Northern Colorado, 2000.
Medizade, Mason (1984) Mechanical Engineering	Professor	B.S., Abadan Institute of Technology, 1978; M.S., University of Southern California, 1980; Ph.D., 1984.
Mehiel, Eric A. (2004) Aerospace Engineering	Professor	B.S., University of California, Santa Barbara, 1998; M.S., University of Colorado, 2001; Ph.D., 2003.
Meisenheimer, Kristen (2009) Chemistry and Biochemistry	Associate Professor	B.S., California Polytechnic State University, San Luis Obispo, 1992; Ph.D., University of Colorado, Boulder, 1998.
Mello, Joseph D. (1998) Mechanical Engineering	Professor	B.S., California Polytechnic State University, 1983; M.S., 1989; Ph.D., University of California, Davis, 1996.
Mendes, Anthony A. (2004) Mathematics	Professor	B.S., University of California, Irvine, 2000; M.A., University of California, San Diego, 2001; Ph.D., 2004.
Metcalf, Lynn E. (1986) Industrial Technology and Packaging	Professor	B.A., University of Oregon, 1978; M.I.M., American Graduate School of International Management, 1981; Ph.D., University of South Carolina, 1986.
Mewes, Matthew (2014) Physics	Assistant Professor	B.A., Concordia College, 1998; M.S., Indiana University 2004; Ph.D., 2004.
Meyers, Joan (2017) Social Sciences	Assistant Professor	B.A., Cornell University, 1988; M.A., California State University, San Francisco, 1999; M.A., University of California, Davis, 2001; Ph.D., University of California, Davis, 2009.
Miklowitz, Paul S. (1988) Philosophy	Professor	B.A., University of California, Santa Cruz, 1977; M.A., University of Chicago, 1979; M.Phil., Ph.D., Yale University, 1988.
Milbourne, Chelsea (2014) English	Assistant Professor	B.A., Duke University, 2003; M.A., University of North Carolina, 2009; Ph.D., University of North Carolina, 2014.
Miller, Charles (Tad) R. (1987) Accounting	Professor	B.A., College of Wooster, 1970; M.B.A., University of Arizona, 1980; Ph.D., 1987. Certified Public Accountant.
Mitchell, David (2004) Physics	Professor	B.S., George Washington University, 1998; M.A., University of California, San Diego, 2001; Ph.D., 2004.
Mock, Rodney (2008) Accounting	Professor	J.D., University of Oregon School of Law, 2002; L.L.M., University of Washington School of Law, 2004.
Moelter, Matthew J. (1998) Physics	Professor	B.S., University of California, Irvine, 1981; Sc.M., Brown University, 1983; Ph.D., 1989.
Moore, Matthew J. (2006) Political Science	Professor	B.A., Eugene Lang College, 1997; Ph.D., Johns Hopkins University, 2004.
Moreno, J. Kelly (1991) Psychology and Child Development	Professor	B.S., University of California, Santa Barbara, 1980; M.S., University of Utah, 1985; Ph.D., 1988. Licensed Psychologist, California.
Morris, Andrew D. (2000) History	Professor	B.S., Harvey Mudd College, 1991; M.A., University of California, San Diego, 1996; Ph.D., 1998.
Moss, Robb E. S. (2006) Civil and Environmental Engineering	Professor	B.S., North Carolina State University, 1995; M.S., Utah State University, 1997; Ph.D., University of California, Berkeley, 2003. Registered Professional Engineer, California.
Muleta, Misgana (2008) Civil and Environmental Engineering	Professor	B.S., Arbaminch University, 1996; M.S., National University of Ireland, Galway, 1999; Ph.D., Southern Illinois University, Carbondale, 2003. Registered Professional Engineer, California.
Munoz-Christian, Karen (2007) World Languages and Cultures	Professor	B.S., Iowa State University, 1981; M.A., Wichita State University 1985; Ph.D., University of California, Irvine, 1994.
Murphy, Kathleen S. (2007) History	Professor	B.A., University of Virginia, 2001; M.A., Johns Hopkins University, 2003; Ph.D., 2007.
Murray, William R. (1999) Mechanical Engineering	Professor	B.S., University of Texas, Austin, 1975; M.S., 1976; Ph.D., Massachusetts Institute of Technology, 1988.
Mwangi, James (2003) Architectural Engineering	Professor	B.Sc., University of Nairobi, Kenya, 1984; MSc., University of Lagos, Nigeria; Ph.D., University of California, Davis, 2001. Registered Structural Engineer and Professional Engineer, California.

Nafisi, Ahmad (1983) Electrical Engineering	Professor	B.S., Arya Mehr University of Technology, Iran, 1975; M.S., University of Southern California, 1977; Ph.D., 1983.
Navarro, Jenell R. (2012) Ethnic Studies	Associate Professor	B.A., Oklahoma Baptist University, 2001; M.A., Claremont Graduate University, 2007; Ph.D., 2011.
Navarro, Jose (2012) Ethnic Studies	Associate Professor	B.A., University of California, Berkeley, 2002; M.A., University of Southern California, 2008; Ph.D., 2012.
Navarro, Oscar (2016) School of Education	Assistant Professor	B.A., University of California, Los Angeles, 2005; California, Single Subject Teaching Credential, 2007; M.A., University of California, Los Angeles, 2009; Ph.D., University of California, Los Angeles, 2016.
Nazmi, Aydin (2009) Food Science and Nutrition	Associate Professor	B.S., University of California, Davis, 1998; M.S., University of London, U.K.; 2004; Ph.D., Federal University of Pelotas, Brazil, 2007.
Neff, Grace Ann (1995) Chemistry and Biochemistry	Professor	B.S., New Mexico State University, 1989; Ph.D., University of Oregon, 1998.
Neill, Dawn (2008) Social Sciences	Professor	B.A., Louisiana State University, 1996; M.A., 1999; M.A., University of Washington, 2004; Ph.D., 2007.
Neill, Stern (2008) Marketing	Professor and Area Chair	B.A., Louisiana State University, 1992; M.B.A., Southeastern Louisiana University, 1994; Ph.D., Louisiana State University, 2000.
Nelson, Jill (2008) Architectural Engineering	Associate Professor	B.S., University of Nevada, Reno, 1978; M.S., University of Washington, 1982. Registered Structural and Civil Engineer, California and Washington; LEED AP.
Nelson, Yarrow M. (1999) Civil and Environmental Engineering	Professor Emeritus	B.S., University of California, Berkeley, 1979; M.S., Cornell University, 1992; Ph.D., 1997.
Nelson, Leslie, R. (2018) Communication Studies	Assistant Professor	B.A., University of Nebraska, Lincoln, 2012; M.A., University of Missouri, 2014; Ph.D., 2018.
Nico, Phillip L. (2000) Computer Science, Computer Engineering	Professor	B.A., University of California, Berkeley, 1991; M.S., University of California, Davis, 1994; Ph.D., 2000.
Niku, Saeed B. (1983) Mechanical Engineering	Professor	B.S., Tehran Polytechnic University, 1975; M.S., Stanford University, 1976; Ph.D., University of California, Davis, 1982. Registered Professional Engineer, California.
Noland, Jaymie J. (1999) Animal Science	Professor and Department Head	B.S., Colorado State University, 1981; D.V.M., Colorado State University, 1987.
Noori, Mohammad (2005) Mechanical Engineering	Professor	B.S., University of Illinois at Urbana-Champaign, 1977; M.S., Oklahoma State University, 1980; Ph.D., University of Virginia, 1984.
Nuttall, Brent (2003) Architectural Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1986; M.S., University of California, Berkeley, 1987. Registered Structural and Civil Engineer, California.
Nuworsoo, Cornelius K. (2005) City and Regional Planning	Professor	B.S., University of Science and Technology, Ghana, 1981; M.S., Morgan State University, 1986; MCP, University of California, Berkeley, 2002; Ph.D., 2004. American Institute of Certified Planners. Institute of Transportation Engineers.
O'Bryant, Camille P. (1999) College of Science and Mathematics, Kinesiology	Associate Dean and Professor	A.B., 1983; M.S., Smith College, 1986; Ph.D., Ohio State University, 1996.
O'Hara, Christine E. (2008) Landscape Architecture	Associate Professor	B.A., Stanford University, 1987; M.L.A. University of Washington, 2002. Certificate in Preservation Planning.
Oliver, John Y. (2007) Computer Engineering, Electrical Engineering	Associate Professor, Director of Computer Engineering	B.S., Boston University, 1998; M.S., University of California, Davis, 2006; Ph.D., 2007.
Olsen, Eric (2004) Industrial Technology and Packaging	Professor and Area Chair	B.S., University of Maine at Orono, 1979; M.B.A., Virginia Polytechnic Institute and State University, 1987; Ph.D., The Ohio State University, 2004.
Olsen, Clare (2011) Architecture	Associate Professor	B.A., Brown University, 1997; M.Arch., University of California, Los Angeles, 2003.
Orth, Joel J. (2003) History	Associate Professor	B.A., California Polytechnic State University, San Luis Obispo, 1996; M.A., Iowa State University, 1998; Ph.D., 2004.

Osborn, Brian (2016) Architecture	Assistant Professor	B.L.A. California Polytechnic State University, San Luis Obispo, 2001; M.Arch, Pratt Institute, School of Architecture, Brooklyn, New York, 2008. Licensed Landscape Architect in the Commonwealth of Virginia, NCARB.
Oulton, Rebekah L. (2013) Civil and Environmental Engineering	Assistant Professor	B.S., Harvey Mudd College, 1993; M.S., 1994; Ph.D., University of Iowa, 2013. Registered Professional Engineer, California. Leed Accredited Professional.
Owen, Franklin C. (1998) Mechanical Engineering	Professor Emeritus	BSME, Mississippi State University, 1978; MSME, Oregon State University, 1983; Ph.D., University of Texas, 1998. Registered Professional Engineer, Maine.
Oñate-Madrado, Andrea (2016) History	Assistant Professor	B.A., New York University, 2003; M.A., Princeton University, 2011: Ph.D., 2016
Pal, Nirupam (1995) Civil and Environmental Engineering	Professor	B. Tech, Calcutta University, India, 1984; M. Tech, 1986; Ph.D., New Jersey Institute of Technology, 1993.
Palandoken, Hasan (2009) Chemistry and Biochemistry	Associate Professor	B.S., California State University, Chico, 1993; M.S., University of California, Davis, 1997; Ph.D., 2006.
Pan, Jianbiao J. (2003) Industrial and Manufacturing Engineering	Professor	B.E., Xidian University, Xian, China, 1990; M.S., Tsinghua University, Beijing, China, 1996; Ph.D., Lehigh University, 2000. Certified Quality Engineer. Certified Reliability Engineer.
Pande, Anurag (2008) Civil and Environmental Engineering	Associate Professor	B.Tech., Indian Institute of Technology, Bombay, 2002; M.S., University of Central Florida, 2003; Ph.D., 2005.
Pantoja, Maria (2016) Computer Science, Computer Engineering	Assistant Professor	B.S., University of Valencia, Spain, 1992; M.S., California State University, East Bay, 2004; Ph.D. Santa Clara University, 2009.
Papathakis, Peggy C. (2006) Food Science and Nutrition	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., University of California, Davis, 2000; Ph.D., 2005. Registered Dietitian.
Paquin, Dana (2008) Mathematics	Associate Professor	B.S., Davidson College, 2002; Ph.D., Stanford University, 2007.
Pascual, Christopher C. (2000) Mechanical Engineering	Professor	B.S., Cornell University, 1985; M.S., Georgia Institute of Technology, 1996; Ph.D., 1999. Registered Professional Engineer, California.
Pasulka, Alexis L. (2017) Biological Sciences	Assistant Professor	B.S., Arizona State University, 2005; M.S., University of California, San Diego, 2009. Ph.D., 2013.
Patel, Pratish A. (2013) Finance	Associate Professor	B.S., Georgia Institute of Technology, 2002; M.S., UC Berkeley, 2005; Ph.D., UC Berkeley, 2013.
Patton, Linda J. (1991) Mathematics	Professor	B.A., University of California, San Diego, 1985; M.A., 1987; Ph.D., 1991.
Pearse, Erin P.J. (2012) Mathematics	Associate Professor	B.S., University of California, Riverside, 1998; M.S., 2001; Ph.D., 2006.
Pedrotti, Jennifer Teramoto (2003) College of Liberal Arts, Psychology and Child Development	Associate Dean and Professor	B.A., University of California, Davis, 1996; M.S., University of Kansas, 2000; Ph.D., 2003.
Pendergast, William R. (2000) Management, HR, and Information Systems	Professor	B.A., University of Notre Dame, 1966; M.A., Columbia University, 1968; Ph.D., 1971.
Perrine, John D. (2008) Biological Sciences	Professor	B.S., Vanderbilt University, 1991; M.S., Miami University, Ohio, 1995; Ph.D., University of California, Berkeley, 2005.
Peters, Jason (2015) English	Assistant Professor	B.A., Rhode Island College, 1999; M.F.A., Emerson College, 2010; Ph.D., University of Rhode Island, 2015.
Peterson, Daniel G. (2003) Animal Science	Professor	B.S., University of California, Davis, 1999; Ph.D., Cornell University, 2003.
Peterson, Zachary (2013) Computer Science	Associate Professor	B.S., Univ of CA, Santa Cruz, 2000; M.S., 2002; M.S., The Johns Hopkins University Information Security Institute, 2005; Ph.D., The Johns Hopkins University, 2006.
Peuker, Steffen (2014) Mechanical Engineering	Assistant Professor	Dipl.-Ing. (FH), Mannheim University of Applied Sciences, Mannheim, Germany; M.S., University of Illinois at Urbana-Champaign, 2006; Ph.D., 2010.
Phelan, Suzanne (2008) Kinesiology	Professor	B.A./B.S., University of Colorado at Boulder, 1989; M.A., MCP Hahnemann University, 1999; Ph.D., 2001.

Phillips, Stephen J. (2005) Architecture	Professor	B.A.Arch., Yale, 1991; M.Arch., University of Pennsylvania Graduate School of Architecture, 1994; M.A., Princeton, 2003; Ph.D., 2008. Registered Architect., California.
Piburn, Patti (2006) Journalism	Assistant Professor	B.S., Arizona State University, Tempe, 1995; B.A., Arizona State University, Tempe, 1995; M.S., South Dakota State University, Brookings, 2013.
Pierce, Todd J. (2005) English	Professor	B.A., Southern California College, 1988; M.A., Oregon State University, 1992; M.F.A., University of California, Irvine, 1995; Ph.D., Florida State University, 2003.
Pileggi, Shannon (2015) Statistics	Assistant Professor	B.A., East Carolina University, 2005; M.S., Emory University, 2011; Ph.D., 2012.
Pilkington, Wayne (2005) Electrical Engineering	Associate Professor	B.S., Lafayette College, 1981; M.S., Rochester Institute of Technology, 1989; M.S., University of Rochester, 1999; Ph.D., 2005.
Pilolla, Kari (2014) Food Science and Nutrition	Assistant Professor	B.S., California State University, Fresno, 1998; M.S., San Diego State University, 2002; Ph.D., Oregon State University, 2013; Registered Dietitian.
Plummer, William E. (1979) Animal Science	Professor Emeritus	B.S., North Carolina State University, 1970; M.S., 1976; Ph.D., Utah State University, 1979.
Pokharel, Siroj (2018) Animal Science	Assistant Professor	B.V.Sc. A.H., Tribhuvan University, 2007; M.S., University of Nebraska Lincoln, 2011; Ph.D., Texas Tech University, 2016.
Ponitz, Jeffrey A. (2011) Architecture	Associate Professor	B.S., University of Michigan, 2002; M.Arch., 2004; M.Arch., University of Virginia, 2008. Registered Architect, Illinois.
Porumamila, Hemanth (2008) Mechanical Engineering	Associate Professor	B.E., BMS College of Engineering, Bangalore, India, 2000; M.S., Iowa State University, 2003; Ph.D., 2007.
Poshtan, Majid (2015) Electrical Engineering	Associate Professor	B.S., Tehran University-Tehran 1988; M.Sc., University of New Brunswick-Fredericton 1992; Ph.D., Tulane University, New Orleans 2000
Pouraghabagher, A. Reza (1979) Industrial and Manufacturing Engineering	Professor	B.S., University of Colorado, 1972; M.S., University of California, 1973; Ph.D. University of Iowa, 1977. Certified in Production and Inventory Management (CPIM).
Preston, William L. (1980) Social Sciences	Professor	B.A., Fresno State College, 1971; M.A., California State University, Fresno, 1973; Ph.D., University of Oregon, 1979.
Prince, James P (2016) College of Agriculture, Food and Environmental Sciences	Associate Dean	B.S., University of California, Davis, 1984; Ph.D., Cornell University, 1991
Prodanov, Vladimir (2009) Electrical Engineering	Associate Professor	M.S., State University of New York, Stony Brook, 1995; Ph.D., 1997.
Pulitano, Elvira (2006) Ethnic Studies	Professor	Laurea (B.A.), Università di Messina, Italy, 1993; University of New Mexico, 1997; Ph.D., 2002.
Qenani-Petrela, Eivis (2002) Agribusiness	Professor	B.S., University of Tirana, Albania, 1987; M.A., Washington State University, 1998; Ph.D., 2002.
Qu, Bing (2008) Civil and Environmental Engineering	Associate Professor	B.S., Tongji University (China), 2001; M.S., 2004; Ph.D., State University of New York at Buffalo, 2008. Registered Professional Engineer, California.
Ragsdale, Joseph J. (2002) Landscape Architecture	Associate Professor	B.A., University of California, Berkeley, 1991; M.L.A., University of Virginia, 2000. Registered Landscape Architect, California.
Rahim, Ashraf (2003) Civil and Environmental Engineering	Professor	B.S., University of Mansoura, Egypt, 1986; M.S., 1991; Ph.D., University of Mississippi, Oxford, 2001. Registered Professional Engineer, California.
Rahman, Shikha (2007) Civil and Environmental Engineering	Professor	B.S., Bangladesh University of Engineering and Technology (BUET), 1995; M.S., 1998; Ph.D., Georgia Institute of Technology, 2002. Registered Professional Engineer, Mississippi.
Rajakaruna, Nishanta (2017) Biological Sciences	Associate Professor	B.S., College of the Atlantic, 1994; M.S., University of British Columbia, 1998; Ph.D., 2003.
Ramezani, Cyrus A. (1999) Finance	Professor	B.A., University of California, Santa Cruz, 1984; M.S., 1988; M.S., University of California, Berkeley, 1991; Ph.D., 1992.
Ramrakhiani, Sonia H. (2017) School of Education	Assistant Professor	B.A., Psychology, St. Xavier's College in India, 2010; M.S., Clinical Mental Health Counseling, Syracuse University, 2013; Ph.D., Old Dominion University, 2017.
Rastad, Mahdi (2012) Finance	Associate Professor	M.S., University of Illinois Urbana Campus 2009; Ph.D., University of Illinois Urbana Campus, 2012

Razi, Alpen (2015) Ethnic Studies	Assistant Professor	B.A., University of Toronto, 2008; M.A., 2009; Ph.D., 2015.
Reaves, Scott (2003) Food Science and Nutrition	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1991; Ph.D., University of Arizona, 1995.
Rees, Gordon L. (2015) Natural Resources Management and Environmental Sciences	Assistant Professor	B.S., Brigham Young University, 2009; M.S., University of California, Davis, 2015; Ph.D., University of California, Davis, 2015.
Reich, Jonathan (2001) Architecture	Professor	B.A., University of Washington, Seattle, 1979; B.A.E.D., 1979; M.Arch., University of California, Berkeley, 1983. AIA, Registered Architect, California and Washington.
Reid, Anne (2015) History	Assistant Professor	B.A., California State University, Los Angeles, 1999; MLIS, San José State, 2005; M.A., University of Southern California, 2009; Ph.D., 2013.
Rein, Steven (1998) Statistics	Associate Professor	B.A., University of California, Los Angeles, 1987; M.A., University of California, Berkeley, 1989; Ph.D., 1993.
Retsek, Dylan Q. (2003) Mathematics	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1996; M.A., Washington University, 1997; Ph.D., 2001.
Ribeiro, Bruno (2012) Graphic Communications	Associate Professor	B.S., Universidade do Estado do Rio de Janeiro, 2002; M.B.A, Fundação Getúlio Vargas, 2007; M.F.A., Ohio State University, 2012.
Ribeiro, Bruno (2012) Graphic Communication	Associate Professor	B.S., Universidade do Estado do Rio de Janeiro, 2002; M.B.A, Fundação Getúlio Vargas, 2007; M.F.A., Ohio State University, 2012.
Rice, Margaret (Peggy) S. (1996) Chemistry and Biochemistry	Professor	B.S., University of California, Los Angeles, 1979; Ph.D., University of Oregon, 1990.
Richert, Benjamin P. (2003) Mathematics	Department Chair	B.S., Wheaton College, 1995; Ph.D., University of Illinois, Urbana-Champaign, 2000.
Ridgely, John R. (2001) Mechanical Engineering	Professor	B.S., University of California, Berkeley, 1986; M.S., 1988; Ph.D., 2001.
Riley, Kate J. (2003) Mathematics	Professor	B.S., South Dakota State University, 1980; M.S., Montana State University, 1992; Ph.D., 2003.
Rinzler, Paul (1997) Music	Professor	B.A., University of California at Santa Barbara, 1977; M.A., 1980; D.A., University of Northern Colorado, 1988.
Ritter, Matthew K. (2003) Biological Sciences	Professor	B.S., University of California, Santa Barbara, 1996; Ph.D., University of California, San Diego, 2002.
Robbins, Marian E. (2004) Mathematics	Professor	B.A., Agnes Scott College, 1986; M.S., University of Virginia, 1989; Ph.D., 1992.
Robins, Lori (2008) Chemistry and Biochemistry	Associate Professor	B.S., Brandeis University, 2002; Ph.D., University of California, Davis, 2007.
Rodgers, Julie Spencer (2012) Psychology and Child Development	Associate Professor	B.Sc., Carleton University, 1993; B.A., 1995; M.S., San Francisco State University, 1998; Ph.D., University of California, Santa Barbara, 2005.
Ronan, Briana M. (2014) School of Education	Assistant Professor	B.A., University of Texas, Austin, 2005; M.A., Universidad de Alcalá, Spain, 2008; M.A., Teachers College, Columbia University, 2010; Ed.D., Teachers College, Columbia University, 2014.
Rong, Xiaoying (2005) Graphic Communication	Professor	B.E., Beijing Institute of Printing, 1992; M.B.A., Beijing Institute of Technology, 1999; M.S., Western Michigan University, 2003; Ph.D., Western Michigan University, 2007.
Rosenthal, Mira (2016) English	Assistant Professor	B.A., Reed College, 1996; M.F.A., University of Houston, Texas, 2005; Ph.D., Indiana University, 2011.
Ross, Kevin James (2012) Statistics	Associate Professor	B.S., University of North Carolina at Chapel Hill, 1997; M.S., 2005; Ph.D., 2006.
Rossmann, Allan J. (2001) Statistics	Professor and Department Chair	B.A., Geneva College, 1984; M.S., Carnegie Mellon University, 1986; Ph.D., 1989.
Roy, Soma (2008) Statistics	Associate Professor	B.Sc., Delhi University, 2000; M.Sc., 2002; M.S., The Ohio State University, 2005; Ph.D., 2008.
Rucas, Stacey L. (2005) Social Sciences	Professor	B.A., University of Texas, Arlington, 1998; M.A., 2000; Ph.D., University of New Mexico, 2004.
Rudi, Jeta (2017) Agribusiness	Assistant Professor	B.A., Berea College, 2010; M.S. Virginia Tech, 2012, University of Minnesota, Ph.D., 2016.

Ruef, Michael (1999) School of Education	Professor Emeritus	B.A., University of San Francisco, 1966; M.A., San Diego State University, 1992; Ph.D., University of Kansas, 1997.
Rummell, Kathryn (1997) College of Liberal Arts	Interim Dean of CLA and Professor	B.A., Centre College, 1990; M.A., University of North Carolina at Chapel Hill, 1992; Ph.D., 1997.
Russell, Craig H. (1982) Music	Professor Emeritus	B.M., University of New Mexico, 1973; M.M., 1976; Ph.D., University of North Carolina, 1981.
Ruszczky, Steven (2017) English	Assistant Professor	B.A., University of California, Santa Barbara, 2003; M.A., University of Auckland, 2007; Ph.D., State University of New York at Buffalo, 2014.
Ruttenberg, Benjamin I. (2013) Biological Sciences	Associate Professor	B.A., Tufts University, 1994; M.S., Yale University, 1999; Ph.D., University of California, Santa Barbara, 2006.
Ryalls, Emily (2017) Communication Studies	Assistant Professor	B.A., James Madison University, 1997; M.A., The University of Alabama, 1999; Ph.D., University of South Florida, 2011.
Ryan, Kathleen A. (1981) Psychology and Child Development	Professor Emeritus (FERP)	B.A., San Diego State University, 1975; M.A., Bowling Green State University, 1978; Ph.D., 1980.
Ryujin, Donald H. (1989) Psychology and Child Development	Professor	B.A., Stanford University, 1968; M.A., University of Michigan, 1972; Ph.D., 1983.
Sabbag, Anelise G. (2016) Statistics	Assistant Professor	B.S., Universidade de Sao Paulo, 2009; M.A., University of Minnesota, 2013; Ph.D., 2016.
Sadek, Mohammad (2018) BioResource and Agricultural Engineering	Assistant Professor	B.S., Bangladesh Agricultural University, Bangladesh, 2005; M.S., Asian Institute of Technology, Thailand, 2008; Ph.D., University of Manitoba, Canada, 2013. Registered Professional Engineer, Canada.
Saghri, John A. (2000) Electrical Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1973; M.S., Oregon State University, 1975; Ph.D., Rensselaer Polytechnic Institute, 1979.
Saha, Koushik (2010) Industrial Technology and Packaging	Associate Professor	B.S., G.B. Pant University, India, 1998; M.S., University of Florida, 2001; M.S., Michigan State University, 2005; Ph.D., Michigan State University, 2010
Saliklis, Edmond P. (2005) Architectural Engineering	Professor	B.S., University of Illinois, Chicago, 1984; M.S., Syracuse University, 1988; Ph.D., University of Wisconsin, Madison, 1992. Registered Civil Engineer, California.
Sanchez, Fernando Fabio (2011) World Languages and Cultures	Associate Professor and Department Chair	B.A., Universidad La Salle, Mexico, 1995; M.A., University of Colorado, Boulder, 2000; Ph.D., 2006.
Sattler, Meredith J. (2014) Architecture	Assistant Professor	B.A. Studio Art, Vassar, 1995; M.Arch., M.Environmental Management, Yale, 2010.
Saunders, Karl F. (2004) Physics	Professor and Department Chair	B.S., Dublin City University, 1996; Ph.D., University of Oregon, 2001.
Savage, Richard (2002) Biomedical Engineering	Professor	B.S., Juniata College, 1975; Ph.D., Indiana University, 1979.
Schaeffer, Robert K. (2014) Social Sciences	Professor	B.A., University of California, Santa Cruz, 1975; M.A., State University of New York, Binghamton, 1977; Ph.D., State University of New York, Binghamton, 1984.
Schaffner, Andrew (1997) Statistics	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1992; M.S., University of Washington, 1994; Ph.D., 1997.
Schinck-Mikel, Amelie (2009) Mathematics	Associate Professor	B.Sc., Concordia University, 1999; M.Sc., 2001; Ph.D., University of North Carolina at Charlotte, 2009.
Schlemer, Lizabeth T. (1993) Industrial and Manufacturing Engineering	Professor and Interim Associate Dean	B.S., California Polytechnic State University, San Luis Obispo, 1981; M.S., University of Southern California, 1986; M.B.A., 1986; Ph.D., University of California, Santa Barbara, 2007.
Schlosser, Peter (2016) Graphic Communication	Assistant Professor	B.S., University of Wisconsin-Stout, 1978; M.S., University of Wisconsin-Stout, 1992; Ph.D., University of Wisconsin-Stout, 2010.
Schnupp, Alvin J. (1988) Theatre and Dance	Professor	B.S., Millersville State College, 1974; M.A., Bowling Green State University, 1979; Ph.D. University of California, Los Angeles, 1985.
Scholz, Joachim (2014) Marketing	Assistant Professor	M.A., FH Nordakademie, Germany, 2004; M.Sc., University of Exeter, UK, 2007; Ph.D., Queen's University, Canada, 2014.
Schroeter, Christiane (2007) Agribusiness	Professor	B.S., Justus-Liebig University, 1997; M.S., 2001; M.S., Kansas State University, 2000; Ph.D., Purdue University, 2005.

Schuster, Peter J. (2003) Mechanical Engineering	Professor	B.A., Cornell University, 1991; M.S., Stanford University, 1992; Ph.D., Michigan Technological University, 2000.
Schwab, Keri (2013) Experience Industry Management	Associate Professor	B.A., James Madison University, 2000; M.A. and Ph.D., University of Utah, 2011.
Schwartz, Debora (1996) English	Associate Professor	A.B., Bryn Mawr College, 1982; M.A., Princeton University, 1986; Ph.D., 1994.
Schwartz, Peter V. (2000) Physics	Professor	B.S., Massachusetts Institute of Technology, 1986; M.S., Princeton University, 1993; Ph.D., 1998.
Schwartz, Gregory (2013) BioResource and Agricultural Engineering	Assistant Professor	B.S., Cal Poly State University, San Luis Obispo, 1995; M.S., Clemson University, 1998; Ph.D., Clemson University, 2004.
Scott, Gregory E. (2011) Chemistry and Biochemistry	Associate Professor	B.S., Davidson College, 2004; Ph.D., University of Illinois, Urbana-Champaign, 2011.
Scriven, Tal E. (1980) Philosophy	Professor Emeritus	B.A., University of South Florida, 1976; M.A., 1977; Ph.D., University of Southern California, 1980.
Selby, Michael J. (1991) Psychology and Child Development	Professor Emeritus	B.S., University of California, Santa Barbara, 1971; M.S., California Polytechnic State University, San Luis Obispo, 1981; Ph.D., Memphis State University, 1988. Licensed Psychologist, California.
Self, Brian P. (2006) Mechanical Engineering	Professor	B.S., Virginia Polytechnic Institute and State University, 1988; M.S., 1991; Ph.D., University of Utah, 1996.
Sena, James (1987) Management, HR, and Information Systems	Professor	B.S., Xavier University of Ohio, 1961; M.B.A., 1964; M.S., University of Dayton, 1968; D.B.A., University of Kentucky, 1972.
Seng, John S. (2003) Computer Science, Computer Engineering	Professor	B.S., Northwestern University, 1997; M.S., University of California, San Diego, 1999; Ph.D., 2003.
Settle, Allen K. (1970) Political Science	Professor Emeritus	B.A., University of California, Santa Barbara, 1966; M.A., 1967; Ph.D., 1970.
Shaban, Ali O. (1984) Electrical Engineering	Professor	B.S., University of Tripoli, 1974; M.S., University of Southern California, 1978; Ph.D., Oregon State University, 1985.
Shafran, Aric (2007) Economics	Associate Professor and Area Chair	B.S., Cornell University, 1999; M.A., University of Colorado, 2003; Ph.D., 2007.
Shan, Yan (2016) Journalism	Assistant Professor	B.A., Nanjing University of Science and Technology, 2009; M.A., University of Central Florida, 2011; Ph.D., University of Georgia, 2014.
Shani, Abraham (Rami) B. (1983) Management, HR, and Information Systems	Professor	B.A., University of Tel Aviv, 1972; M.A., 1978; Ph.D., Case Western Reserve University, 1981.
Shapiro, Jonathan (1998) Mathematics	Professor	B.A., University of California, Berkeley, 1988; Ph.D., 1995.
Sharpe, John P. (1995) Physics	Professor	B.Sc., Edinburgh University, 1985; Ph.D., 1989.
Shaw-Smith, Unique R. (2015) Social Sciences	Assistant Professor	B.A., California State University, Chico, 2009; M.A., Bowling Green State University, 2011; Ph.D., Bowling Green State University, 2014.
Shelton, Mark (1982) Horticulture and Crop Science	Professor Emeritus	B.S., University of Idaho, 1977; M.S., Purdue University, 1980; Ph.D., Utah State University, 1989. Associate Dean. Registered Professional Entomologist.
Sherman, Morgan P. (2008) Mathematics	Associate Professor	B.A., Knox College, 1999; M.A., Columbia University, 2000; M.Phil., 2004; Ph.D., 2005.
Shields, Jennifer (2015) Architecture	Assistant Professor	B.S. Arch, University of Virginia, 2000; M. Arch, University of Virginia, 2004. Registered Architect, North Carolina, NCARB
Shin, Joongmin (2017) Industrial Technology and Packaging	Associate Professor	B.S., Food Science Technologies, Woosuk University South Korea 1997, M.S., School of Packaging, Michigan State University 2003, Ph.D., School of Packaging Michigan State University 2007
Shollenberger, Kim A. (2002) Mechanical Engineering	Professor	B.S., Cornell University, 1989; M.S., University of California, Berkeley, 1991; Ph.D., 1994.

Siembieda, William J. (1997) City and Regional Planning	Professor	B.A., University of California, Berkeley, 1965; MCRP, University of California, Berkeley, 1967; MPA, California State University, San Diego, 1970; Ph.D., University of California, Los Angeles, 1990. American Institute of Certified Planners.
Sikalidis, Angelos (2018) Food Science and Nutrition	Associate Professor	BSc/MEng., Aristotle University of Thessaloniki, Greece, 2003; MS, University of California, Berkeley, 2004; MSc, University of California, Berkeley, 2006; PhD, Cornell University, 2010; Post-Doctorate, Harvard Medical School, 2013
Silvestri, Michael G. (1978) Chemistry and Biochemistry	Professor	B.S., University of California, Santa Barbara, 1973; Ph.D., University of California, Santa Cruz, 1977.
Simonian, Lonny G. (2003) Construction Management	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1978; M.S., University of California, Berkeley, 1992. Registered Professional Engineer, Certified Project Management Professional.
Singh, Jagjit (Jay) (2003) Industrial Technology and Packaging	Professor	B.S., Poona University, Pune, India, 1992; M.S., Michigan State University, 1998; Ph.D., 2002.
Sklar, Jeffrey C. (2005) Statistics	Professor	B.A.S., University of California, Davis, 1995; M.A., University of California, Santa Barbara, 1998; Ph.D., 2003.
Slem, Charles M. (1975) Psychology and Child Development	Professor Emeritus	B.A., University of California, Los Angeles, 1968; Ph.D., Wayne State University, 1975.
Slivovsky, Lynne A. (2003) Electrical Engineering, Computer Engineering	Professor	B.S., Purdue University, 1992; M.S., 1993; Ph.D., 2001.
Smidt, Robert K. (1978) Statistics	Professor Emeritus	B.S., Manhattan College, 1971; M.S., Rutgers University, 1973; Ph.D., University of Wyoming, 1976.
Smilkstein, Tina (2009) Computer Engineering, Electrical Engineering	Associate Professor	B.S., Nanzan University, 1989; M.S., University of California, Berkeley, 2003; Ph.D., 2007.
Smith, Erling A. (2008) Architectural Engineering	Professor Emeritus	B.S., University of Leeds, 1969; Ph.D., University of Durham, 1975.
Smith, Hugh M. (2000) Computer Science, Computer Engineering	Professor	B.S., Xavier University, 1985; M.S., Michigan State University, 1994; Ph.D., 1999.
Smith, Taylor F. (2014) Psychology and Child Development	Assistant Professor	B.A., SUNY Geneseo, Geneseo, 2006; M.S. UNC at Greensboro, 2009; Ph.D., University of North Carolina at Greensboro, 2012; Professional Degree, Brown University/Alpert Med School/RIH, 2014.
Somoza-Norton, Andrea Fabiana (2015) School of Education	Assistant Professor	B.A., University of Nevada, Reno, 1999; M.S., University of Nevada, Reno, 2004; Ed.D., University of Massachusetts, Lowell, 2012.
Spiller, Robert (1989) Animal Science	Professor Emeritus	B.S., California State Polytechnic College, 1969; M.S., 1971; Ph.D., Oregon State University, 1974.
Spiller, William T. (1991) Music	Professor and Department Chair	B.M., University of Washington, 1981; M.M., Indiana University, 1983; D.M.A., University of Southern California, 1991.
Sprayberry, Kim A. (2013) Animal Science	Associate Professor	B.S., University of California, Davis, 1983; DVM, University of California, Davis, 1988; Diplomate, American College of Veterinary Internal Medicine, University of California, Davis, 1998.
Staley, Clinton A. (1988) Computer Science	Professor	B.A., Principia College, 1980; M.S., University of California, Santa Barbara, 1982; Ph.D., 1987.
Stanchev, Lubomir (2015) Computer Science	Associate Professor	B.S., University of Sofia, 1998; M.S., 1998; Ph.D., University of Waterloo, 2005.
Stanko, Taryn (2014) Management, HR, and Information Systems	Associate Professor	B.A., University of California, Los Angeles; M.B.A., New York University; Ph.D., University of California, Irvine.
Stankus, Mark (1998) Mathematics	Professor	B.S., Rensselaer Polytechnic Institute, 1987; Ph.D., University of California, San Diego, 1993.
Stannard, Sandra (2001) Architecture	Professor	B.A., University of California, Berkeley, 1987; M.Arch., University of Washington, 1992. AIA, Registered Architect, California and Idaho.

Stanton, Diana L. (2000) Theatre and Dance	Professor	B.A., University of California, Irvine, 1994; M.F.A., University of Colorado, Boulder, 1997.
Starzyk, Gregory F. (2009) Construction Management	Associate Professor	B.S.C.E., University of Illinois, Urbana-Champaign, 1982; M.P.M., Northwestern University, 2001; J.D., William Howard Taft University, Santa Ana, 2010. Associate Design-Build Certification (Assoc. DBIA), Certified Professional Constructor (CPC).
Stegner, Paul Dustin (2007) English	Professor	B.A., University of San Francisco, 2000; M.A., The Pennsylvania State University, 2002; Ph.D., 2007.
Steinmaus, Scott J. (1998) Horticulture and Crop Science	Professor and Department Head	B.S., University of California, Davis, 1984; Ph.D., University of California, Davis, 1995; Post-doctorate, University of California, Riverside, 1998. Pest Control Advisor, California.
Strand, Christy (2007) Biological Sciences	Professor	B.A., Concordia University 1992; Ph.D., Arizona State University, 2007.
Styles, Stuart W. (1984) BioResource and Agricultural Engineering	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1984; M.B.A., 1988; D.Eng., University of California, Davis, 2001. Registered Civil Engineer, California.
Sun, Dennis L. (2016) Statistics	Assistant Professor	A.B., Harvard College, 2010; Ph.D., Stanford University, 2015.
Sungar, Nilgun (1989) Physics	Professor Emeritus (FERP)	B.S., Middle East Technical University, Turkey, 1979; Ph.D., University of Missouri, 1985.
Surfleet, Christopher Graham (2012) Natural Resources Management and Environmental Sciences	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1993; M.S. Oregon State University 1997; Ph.D. 2008. Certified Professional in Erosion and Sediment Control.
Swan, Benjamin G. (2010) Agricultural Education and Communication	Associate Professor	B.S., California Polytechnic State University, San Luis Obispo, 1997; M.S., 2001; Ph.D., The Ohio State University, 2005.
Sweatt, Lisa I. (2000) Psychology and Child Development	Associate Professor	B.S., University of California, Irvine, 1989; M.A., Ohio State University, 1992; Ph.D., Loyola University Chicago, 1999. Licensed Psychologist, California.
Sze, Lawrence (1998) Mathematics	Associate Professor	B.S., Louisiana State University, Baton Rouge, 1986; M.A., University of California, Los Angeles, 1989; Ph.D., Penn State University, 1998.
Szlavik, Robert (2006) Biomedical Engineering	Professor	B.Eng., McMaster University, 1991; M.Eng., 1994; Ph.D., 1999.
Taufik, (1999) Electrical Engineering	Professor	B.S., Northern Arizona University, 1993; M.S. University of Illinois at Chicago, 1995; Dr. Eng., Cleveland State University, 1999.
Taylor, Emily N. (2005) Biological Sciences	Professor	B.A., University of California, Berkeley, 1998; Ph.D., Arizona State University, 2005.
Taylor, J. Kevin (1999) School of Education	Professor and Interim Director	B.A., Newcastle and Sunderland Polytechnic, Newcastle, England, 1986; M.S., Central Washington University, 1990; Ph.D., University of South Carolina, 1994.
Tejani, James (2009) History	Associate Professor	B.A., University of California, San Diego, 1998; M.A., Columbia University, 2003; Ph.D., 2009.
Teufel, Brady (2006) Journalism	Associate Professor	B.A., University of California, Santa Cruz, 1997; M.A., University of Missouri, 2003.
Thatcher, Tracy (2005) Civil and Environmental Engineering	Professor	B.S., University of California, Davis, 1984; M.S., University of California, Berkeley, 1991; Ph.D., 1996. Registered Professional Engineer, California.
Theodoropoulos, Christine Olympia (2012) College of Architecture and Environmental Design	Dean	B.S., Princeton University, 1979; M.Arch., Yale University, 1985. AIA, Licensed Architect and Registered Professional Civil Engineer, California.
Thompson, John Jay (1998) World Languages and Cultures	Professor	B.A., University of California, Santa Barbara, 1986; M.A., Yale University, 1987; M.Phil., 1989; Ph.D., 1993.
Thompson, Richard P. (1990) Natural Resources Management and Environmental Sciences	Professor	B.S., Oklahoma State University, 1974; M.S., 1978; Ph.D., Texas AM University, 1990. Registered Professional Forester, California and Oklahoma.
Thorncroft, Glen E. (1998) Mechanical Engineering	Professor	BSE, University of Central Florida, 1988; MSME, 1991; Ph.D., University of Florida, 1997.

Thulin, Andrew J. (1998) College of Agriculture, Food and Environmental Sciences	Dean	B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., Kansas State University, Manhattan, 1979; Ph.D., 1985.
Toker, Umut (2015) Architecture	Professor	B. Arch., Middle East Technical Univ., Ankara, Turkey, 1996; MCP Urban Design, Middle East Technical University, Ankara Turkey, 1999; Ph.D., School of Architecture, College of Design, North Carolina State University, Raleigh, NC., 2003. Registered Architect in Turkey, International Union of Architects (UIA).
Tomanek, Lars (2005) Biological Sciences	Professor	B.S., University of Konstanz, Germany, 1995; M.S., 1995; Ph.D., Oregon State University, 1999.
Torres-Bustamente, Cesar (2010) Landscape Architecture	Associate Professor	B.Arch., Universidad de las Américas, Puebla, 2000; M.L.A., RMIT University, 2005; Ph.D., 2009.
Trice, Tom R. (2002) History	Associate Professor	B.A., Louisiana College, 1981; M.A., Louisiana State University, 1987; Ph.D., University of Illinois, 1998.
Trudell, Carmen Gayle (2005) Architecture	Associate Professor	B.Arch., California Polytechnic State University, San Luis Obispo, 2001; M.S., Columbia University, 2006. M.S. Advanced Architectural Design, Columbia University, New York, NY, 2006. Registered Architect, California, New York, NCARB.
Tseng, Marilyn (2017) Kinesiology	Assistant Professor	A.B., Stanford University, 1991; M.A., Stanford University, 1991; Ph.D. University of North Carolina, Chapel Hill, 1998.
Tubeleih, Ashraf (2015) Horticulture and Crop Science	Assistant Professor	B.S., An-Najah National Univ., Nablus, Palestine, 1995; M.S., Université de Lorraine, Nancy, France, 1997; Ph.D., Université de Lorraine, Nancy, France, 2000.
Turner, Clark S. (1999) Computer Science	Professor	B.S., Kings College, 1979; M.A., Pennsylvania State University, 1981; J.D., University of Maine, 1986; Ph.D., University of California, Irvine, 1999.
Twomey, Colleen Larkin (2011) Graphic Communication	Associate Professor	B.S., Rochester Institute of Technology 1989; M.B.A., University of Delaware, 1997.
Ubbink, Johan B. (2016) Food Science and Nutrition	Professor and Department Head	B.S./M.S. Leiden University, Leiden, Netherlands, 1991; Ph.D. Delft University, Delft, Netherlands, 1997.
Vagnoni, David (2015) Animal Science	Assistant Professor	B.S., Tulane University, 1986; M.S., Louisiana State University, 1989; Ph.D., University of Wisconsin, 1995.
Vakalis, Ignatios (2006) Computer Science	Professor	B.S., University of Patras, Greece, 1982; M.S., Western Michigan University, 1988; Ph.D., 1992.
Valencia-Laver, Debra L. (1991) College of Liberal Arts, Psychology and Child Development	Professor and Associate Dean	B.S., University of California, Irvine, 1983; M.S., The Claremont Graduate University, 1988; Ph.D., 1992.
Valle, Victor (1992) Ethnic Studies	Professor Emeritus	B.A., California State University, Long Beach, 1974; M.A., 1978; M.S.J., Northwestern University, 1981.
Van Draanen, Nanine A. (1996) College of Agriculture, Food and Environmental Sciences	Associate Dean	B.S., California Polytechnic State University, San Luis Obispo, 1985; Ph.D., University of California, Berkeley, 1992.
Vanasupa, Linda S. (1991) Materials Engineering	Professor	B.S., Michigan Technological University, 1985; M.S., Stanford University, 1987; Ph.D., 1991.
Vasilaky, Kathryn N. (2017) Economics	Assistant Professor	B.A., Mathematics and Economics, Columbia University 2003, Cert. of Demography, Maryland Population Research Center 2010, Ph.D. University of Maryland 2011
Vees, Dina (2016) Graphic Communication	Assistant Professor	B.S., Carroll University, 2002; M.F.A., Full Sail University, 2013.
Velasquez, Gloria (1985) World Languages and Cultures	Professor	B.A., University of Northern Colorado, 1978; M.A., Stanford University, 1980; Ph.D., 1985.
Ventura, Alison K. (2014) Kinesiology	Associate Professor	B.S., University of California, Davis, 2003; M.S. Pennsylvania State University, 2005; Ph.D. Pennsylvania State University, 2008.
Verma, Priya O. (2011) Natural Resources Management and Environmental Sciences	Associate Professor	B.S., University of Massachusetts, Boston, 2000; M.A., University of California, Santa Barbara, 2004; Ph.D. 2011.
Vernon, J. Scott (1991) Agricultural Education and Communication	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1983; M.S., 1985; Ph.D., Texas AM University, 1991.

Vigil, Samuel A. (1982) Civil and Environmental Engineering	Professor Emeritus	B.S., University of California, Berkeley, 1969; M.S., Texas A M University, 1974; Ph.D., University of California, Davis, 1981. Registered Professional Engineer, California, Board Certified Environmental Engineer, LEED Accredited Professional.
Villablanca, Francis X. (1999) Biological Sciences	Professor	B.S., California Polytechnic State University, San Luis Obispo, 1987; Ph.D., University of California, Berkeley, 1993.
Vokos, Stamatis (2016) Physics	Professor	B.Sc., University of Kent at Canterbury, 1984; M.A., UC Berkeley, 1985; Ph.D., 1990.
Volpe, Richard (2014) Agribusiness	Assistant Professor	B.S., University of Massachusetts, Amherst, 2003; M.S., 2005; Ph.D., University of California, Davis, 2010.
Voulgaris, Carole T. (2018) Civil and Environmental Engineering	Assistant Professor	B.S., Brigham Young University, 2006; M.S., Brigham Young University, 2007; M.B.A., University of Notre Dame, 2012; Ph.D., University of California, Los Angeles, 2017. Registered Professional Engineer, Washington.
Vredevoe, Larisa K. (1999) Biological Sciences	Professor	B.S., University of California, Davis, 1992; Ph.D., 1998.
Waitinas, Catherine (2006) English	Interim Chair and Professor	B.A., St. Bonaventure University, 1996; M.A., University of Illinois at Urbana-Champaign, 1999; Ph.D., 2006.
Waldorf, Daniel (1998) Industrial and Manufacturing Engineering	Professor and Department Chair	B.S., University of Illinois at Urbana-Champaign, 1989; M.S., 1991; Ph.D., 1996. Registered Professional Engineer, California.
Walker, John L. (2001) Statistics	Professor	B.S., University of Chicago, 1988; M.S., Cornell University, 1993; Ph.D., 1995.
Walsh, Daniel W. (1986) Biomedical Engineering, and Materials Engineering	Professor Emeritus	B.S., Rensselaer Polytechnic Institute, 1973; M.S., 1976; Ph.D., 1985.
Walter, Ryan K. (2014) Physics	Assistant Professor	B.S., Cornell University, 2009; M.S., Stanford University, 2010; Ph.D., 2014.
Wang, Xuan (2014) Industrial and Manufacturing Engineering	Assistant Professor	B.S., Tsinghua University, Beijing, 1997; M.S., Tsinghua University, Beijing, 2000; Ph.D., University of California, San Diego, 2006.
Watts, David J. (2007) Landscape Architecture	Associate Professor	B.S.L.A., University of Wisconsin-Madison, 1980; M.S.L.A., 2006. Registered Landscape Architect, Wisconsin.
Watts, Katharine R. (2014) Chemistry and Biochemistry	Assistant Professor	B.S., University of Texas, El Paso, 2006; Ph.D. University of California, Santa Cruz, 2011.
Weber, Paul A. (1999) Construction Management	Associate Professor	B.S., California Polytechnic State University, San Luis Obispo, 1981; B.Arch., 1983; M.B.A., 1992; Ph.D., Colorado State University, 2000. Registered Architect, California. Licensed Building Contractor (B), California.
Weber, TJ (2017) Marketing	Assistant Professor	B.S., Northern Michigan University 2011, M.B.A., Marquette University 2013, Ph.D., Washington State University 2017
Wendt, Dean E. (2002) College of Science and Mathematics, Biological Sciences	Dean and Professor	B.S., California Polytechnic State University, San Luis Obispo, 1993; M.A., 1995; Ph.D., Harvard University, 1999.
Werner, James (2014) Art and Design	Associate Professor	B.A., San Diego State University, 1995; M.F.A., Kent Institute of Art and Design, UK, 2003; Ed.D.C.T., Columbia University Teachers College, 2007.
Westermann, Kimberly (2015) Accounting	Assistant Professor	B.S., Cal Poly University, 2000; Ph.D., Bentley University, 2011.
Westphal, Russell (2008) Mechanical Engineering	Professor	B.S., Washington State University, 1978; M.S., Stanford University, 1979; Ph.D., 1983.
White, Crow (2013) Biological Sciences	Assistant Professor	B.A., University of Oregon, 1997; M.S., University of Montana, 2002; Ph.D., University of California, Santa Barbara, 2008.
White, Matthew E. (2001) Mathematics	Associate Professor	B.S., Cornell University, 1990; M.S., California Polytechnic State University, San Luis Obispo, 1994; Ph.D., University of California, Santa Barbara, 2000.
White, Emily (2015) Architecture	Assistant Professor	B. A. Barnard College, Columbia University, New York, NY, 1999; M. Arch, Southern California Institute of Architecture, 2006.

White, Corey D. (2017) Economics	Assistant Professor	B.A., California State University Chico 2009, M.S., Cornell University 2011, Ph.D., University of California Santa Barbara 2017
Whitt, Michael D. (2017) Biomedical Engineering	Assistant Professor	B.S., Purdue University, 1987; M.S., Rutgers University/UMDNJ, 1994; Ph.D. 1999; M.B.A., University of California, Los Angeles, 2006.
Widmann, James M. (2004) Mechanical Engineering	Professor and Department Chair	B.S., Michigan Technological University, 1987; M.S., Stanford University, 1988; Ph.D., Stanford University, 1995.
Williams, Jason A. (2008) Psychology and Child Development	Associate Professor	B.A., University of California, Riverside, 1989; Ph.D., University of California, Santa Cruz, 2001.
Williams, Jean M. (2000) Political Science	Professor	B.A., Pomona College, 1988; M.A., The Johns Hopkins University, 1996; Ph.D., 1998.
Williams, Amber (2017) Psychology and Child Development	Assistant Professor	B.A., Rice University, 2010; M.S., University of Michigan, Ann Arbor, 2012; Ph.D., 2015.
Winstead, Candace R. (2005) Biological Sciences	Associate Professor	B.A., Augustana College, 1991; Ph.D., Loyola University, 1999.
Wishnie, Jennifer K. (2017) Animal Science	Assistant Professor	B.S., McGill University, 1998; M.S., McGill University, 2000; D.V.M., University of Saskatchewan, 2004; M.P.H., University of Minnesota, 2010; Diplomate, American College of Preventative Medicine, 2011.
Wissel, Stephanie (2015) Physics	Assistant Professor	B.S., University of Dallas, 2004; S.M., University of Chicago, 2005; Ph.D., 2010.
Wolf, Marianne McGarry (1994) Wine and Viticulture	Professor	B.A., The Johns Hopkins University, 1976; M.S., 1977; Ph.D., 1979.
Wolfson, Roberta (2017) English	Assistant Professor	B.A., University of California, Los Angeles, 2009; M.A., University of California, Santa Barbara, 2012; Ph.D., University of Santa Barbara, 2017.
Wong, Jeffrey C. (2002) Horticulture and Crop Science	Professor	B.S., Saint Mary's College of California, 1994; M.S., University of Illinois at Champaign, 1999; Ph.D., 2002. The J. G. Boswell Foundation of Pasadena Endowed Chair.
Wood, Zoe J. (2003) Computer Science	Professor	B.A., University of California, Santa Cruz, 1992; B.S., 1997; M.S., California Institute of Technology, 2000; Ph.D., 2003.
Wood, Leah (2014) School of Education	Assistant Professor	B.S., Davidson College, 2003; M.A.T., University of North Carolina, Charlotte, 2009; Ph.D., University of North Carolina, Charlotte, 2014.
Woodruff, Christopher (2018) Music	Assistant Professor	B.M.E., Louisiana State University, 1991; M.M., Northwestern University, 1996.
Wu, Xi (2005) Mechanical Engineering	Professor	M.S., Chong Qing University, 1991; Dr. Eng., Cleveland State University, 2005.
Yang, Tao H. (1987) Industrial and Manufacturing Engineering	Professor	B.S., Tunghai University, Taiwan, 1978; M.S., San Jose State University, 1982; Ph.D., Arizona State University, 1987.
Yeh, Grace I. (2007) Ethnic Studies	Professor	B.A., Duke University, 1995; M.A., Georgetown University, 2000; M.A., University of California, Los Angeles, 2003; Ph.D., 2007.
Yep, Alejandra (2014) Biological Sciences	Assistant Professor	B.S./M.S., University of Buenos Aires, 1999; Ph.D., 2004.
YeQiang, Lin (2014) Experience Industry Management	Assistant Professor	B.A., Beijing International Studies University, 2008; M.A., California State University, Chico; Ph.D., Pennsylvania State University, 2014.
Yeung, Po Sai Marie (2006) Biological Sciences	Professor	B.Sc., The Chinese University of Hong Kong, 1995; M.S., California Polytechnic State University, San Luis Obispo, 2001; Ph.D., Cornell University, 2004.
Yeung, Vincent (2013) Animal Science	Assistant Professor	B.Sc. (Hon.), The Chinese University of Hong Kong, 1996; M.Sc., California Polytechnic State University, San Luis Obispo, 1999; Ph.D., Cornell University, 2003.
Yip, Christopher L. (1988) Architecture	Professor Emeritus	B.A., University of California, Berkeley, 1971; M. Arch., 1977; Ph.D., 1985.
York, Jonathan (2008) Industrial Technology and Packaging	Associate Professor	B.A., Yale University, 1973; M.A., Michigan State University, 1976; Ph.D., 1979.
Yoshinobu, Stan (2009) Mathematics	Professor	B.A., University of California, San Diego, 1995; M.A., University of California, Los Angeles, 1997; Ph.D., 2000.

Yost, Jennifer M. (2014) Biological Sciences	Assistant Professor	B.S., California Polytechnic State University, 2005; M.S., 2007; Ph.D., University of California, Santa Cruz.
Yu, Xiao-Hua (Helen) (2000) Electrical Engineering	Professor	B.S., TianJin University, People's Republic of China, 1988; M.S., Temple University, 1992; Ph.D., University of California, Irvine, 1998.
Zambrano, Eduardo (2007) Economics	Professor	B.A., Universidad Católica Andrés Bello, Venezuela, 1993; M.A., Cornell University, 1998; Ph.D., Cornell University, 1999.
Zhang, Ning (2007) Political Science	Professor	B.A., Peking University, Beijing, China, 1999; Ph.D., University of California, Santa Barbara, 2007.
Zhang, Shanju (2011) Chemistry and Biochemistry	Associate Professor	B.S., Jilin University, People's Republic of China, 1993; Ph.D., 1998.
Zhang, Xiaozheng (Jane) (2003) Electrical Engineering	Professor and Associate Department Chair	Diplom, University of Erlangen-Nuremberg, Germany, 1997; Ph.D., Georgia Institute of Technology, 2002.
Zheng, Haotian (2017) Animal Science	Assistant Professor	B.S., Northeast Agricultural University, 2007; M.S., Wageningen University, 2010; Ph.D., University of Otago, 2014.
Zohns, Mark A. (1986) BioResource and Agricultural Engineering	Professor Emeritus	B.S., California Polytechnic State University, San Luis Obispo, 1981; M.S., University of California, Davis, 1983; D.Engr., 1986. Registered Mechanical Engineer, California.
Zoller, David J. (2015) Philosophy	Assistant Professor	B.A. Xavier University, 2003; M.A., Fordham University, 2006; Ph.D., 2008.

THE CSU SYSTEM

Welcome to the California State University (CSU) –the nation’s largest comprehensive higher education system with 23 unique campuses serving approximately 484,000 students with more than 50,800 faculty and staff. Each year, the university awards more than 120,000 degrees. CSU graduates are serving as leaders in the industries that drive California’s economy, including business, agriculture, entertainment, engineering, teaching, hospitality and healthcare. Learn more at www.calstate.edu (<http://www.calstate.edu>).

A Tradition of Excellence for More than Five Decades

Since 1961, the CSU has provided an affordable, accessible and high-quality education to more than 3.4 million graduates throughout California. While each campus is unique based on its curricular specialties, location and campus culture, every CSU is distinguished for the quality of its educational programs. All campuses are fully accredited, provide a high-quality broad liberal educational program and offer opportunities for students to engage in campus life through the Associated Students, Inc., clubs and service learning. Through leading-edge programs, superior teaching and extensive workforce training opportunities, CSU students graduate with the critical thinking skills, industry knowledge and hands-on experience necessary for employment and career advancement.

Facts

- In 2015-16, the CSU received \$579 million in research and education grants and contracts by federal, state and regional agencies.
- Today, one of every 20 Americans with a college degree is a CSU graduate.
- 1 in every 10 employees in California is a CSU alumnus.
- The CSU awards 45 percent of the bachelor’s degrees earned in California.
- More than half of all the nurses in the state earn their degrees from the CSU.
- The CSU awards 95 percent of the hospitality/tourism degrees in the state.
- Nearly half of all of the state’s engineers earn their degrees from the CSU.
- The CSU is the leading provider of teacher preparation programs in the state.
- The CSU offers more than 124 fully online and 91 hybrid degree programs and concentrations.
- The CSU offers over 3,800 online courses per term, providing more educational options to students who may prefer an online format to a traditional classroom setting.
- The CSU’s online concurrent enrollment program gives students the ability to enroll in courses offered by other campuses in the CSU.
- Over the past four years, the CSU has issued nearly 50,000 professional development certificates in education, health services, business and technology, leisure and hospitality, manufacturing, international trade, and many other industries.
- Nearly half of the CSU’s 484,000 students are engaged in some type of community service, totaling 32 million hours of service annually.
- More than 13,000 students participate in STEM (science, technology engineering and mathematics) service-learning courses.

- For every \$1 that the state invests in the CSU, the university generates \$5.43 for California’s economy.

Governance

The system is governed by the Board of Trustees, most of whom are appointed by the governor and serve with faculty and student representatives. The CSU Chancellor is the chief executive officer, reporting to the Board. The campus presidents serve as the campus-level chief executive officers. The Trustees, Chancellor and presidents develop systemwide educational policy. The presidents, in consultation with the Academic Senate CSU and other campus stakeholder groups, render and implement local policy decisions.

CSU Historical Milestones

The individual California State Colleges were established as a system with a Board of Trustees and a Chancellor in 1960 by the Donahoe Higher Education Act. In 1972, the system was designated as the California State University and Colleges, and in 1982 the system became the California State University. Today, the CSU is comprised of 23 campuses, including comprehensive and polytechnic universities and, since July 1995, the California Maritime Academy, a specialized campus.

The oldest campus—San José State University—was founded in 1857 and became the first institution of public higher education in California. The newest—CSU Channel Islands—opened in fall 2002, with freshmen arriving in fall 2003.

In 1963, the Academic Senate CSU was established to act as the official voice of CSU faculty in systemwide matters. Also, the California State College Student Presidents Association—which was later renamed the California State Students Association—was founded to represent each campus student association on issues affecting students.

Through its many decades of service, the CSU has continued to adapt to address societal changes, student needs and workforce trends. While the CSU’s core mission has always focused on providing high-quality, affordable bachelor’s and master’s degree programs, over time the university has added a wide range of services and programs to support student success – from adding health centers and special programs for veterans to building student residential facilities to provide a comprehensive educational experience.

To improve degree completion and accommodate students working full- or part-time, the educational paradigm was expanded to give students the ability to complete upper-division and graduate requirements through part-time, late afternoon, and evening study. The university also expanded its programs to include a variety of teaching and school service credential programs, specially designed for working professionals.

The CSU marked another significant educational milestone when it broadened its degree offerings to include doctoral degrees. The CSU independently offers Doctor of Education (Ed.D.), Doctor of Physical Therapy (DPT), Doctor of Audiology (AuD) and Doctor of Nursing Practice (DNP) degree programs. A limited number of other doctoral degrees are offered jointly with the University of California and private institutions in California.

In 2010, in an effort to accommodate community college transfer students, the CSU, in concert with the California Community Colleges (CCC), launched the Associate Degree for Transfer (ADT), which guarantees CCC transfer students with an ADT admission to the CSU with junior status.

Always adapting to changes in technology and societal trends to support student learning and degree completion, the CSU achieved another milestone in 2013, when it launched Cal State Online, a systemwide collection of services that support the delivery of fully online programs from campuses. Now, full-time students have access to fully online courses offered at other CSU campuses.

By providing an accessible, hands-on education that prepares graduates for career success, the CSU has created a network of alumni that is so extensive and renowned that it spans across the globe. As of 2016-17, more than 3.4 million CSU alumni are making a difference in the lives of the people of California and the world.

The CSU strives to continually develop innovative programs, services and opportunities that will give students the tools they need to meet their full potential. In 2016, the university launched Graduation Initiative 2025, a bold plan to support students, increase the number of California's graduates earning high-quality degrees and eliminate achievement and equity gaps for all students. Through this initiative, the CSU is ensuring that all students have the opportunity to graduate according to their personal goals, positively impacting their lives, families and communities. The CSU is committed to providing a quality higher education that prepare students to become leaders in the changing workforce.

Trustees of the California State University

Ex Officio Trustees

The Honorable Edmund G. Brown, Jr.
Governor of California

The Honorable Gavin Newsom
Lieutenant Governor of California

The Honorable Anthony Rendon
Speaker of the Assembly

The Honorable Tom Torlakson
State Superintendent of Public Instruction

Dr. Timothy P. White
Chancellor of The California State University

Officers of the Trustees

The Honorable Edmund G. Brown, Jr. - President
Rebecca D. Eisen - Chair
Adam Day - Vice Chair
Andrew Jones – Secretary
Steve Relyea - Treasurer

Appointed Trustees

Appointments are for a term of eight years, except student, alumni, and faculty trustees, whose terms are for two years. Terms expire in the year in parentheses. Names are listed alphabetically.

- Silas Abrego (2021)
- Jane W. Carney (2022)
- Adam Day (2023)
- Rebecca D. Eisen (2018)
- Douglas Faigin (2017)
- Debra S. Farar (2022)
- Jean P. Firstenberg (2018)
- Emily Hinton (2019)

- Lillian Kimbell (2024)
- Thelma Meléndez de Santa Ana (2017)
- Hugo N. Morales (2020)
- John Nilon (2018)
- J. Lawrence Norton (2019)
- Jorge Reyes Salinas (2018)
- Romey Sabalius (2019)
- Lateefah Simon (2019)
- Peter J. Taylor (2021)

Correspondence with Trustees should be sent to:

c/o Trustees Secretariat
The California State University
401 Golden Shore
Long Beach, CA 90802-4210

Office of the Chancellor

The California State University
401 Golden Shore
Long Beach, California 90802-4210
Phone: 562.951.4000

Name	Title
Dr. Timothy B. White	Chancellor
Mr. Steve Relyea	Executive Vice Chancellor and Chief Financial Officer
Dr. Loren J. Blanchard	Executive Vice Chancellor, Academic and Student Affairs
Mr. Andrew Jones	Executive Vice Chancellor, General Counsel
Mr. Garrett P. Ashley	Vice Chancellor, University Relations and Advancement
Ms. Melissa Bard	Vice Chancellor, Human Resources
Mr. Larry Mandel	Vice Chancellor and Chief University Auditor

Campuses—The California State University

California State University, Bakersfield
9001 Stockdale Highway, Bakersfield, CA 93311-1022
Dr. Horace Mitchell, President
661.654.2782
www.csub.edu (<http://www.csub.edu>)

California State University, Channel Islands
One University Drive, Camarillo, CA 93012
Dr. Erika D. Beck, President
805.437.8400
www.csuci.edu (<http://www.csuci.edu>)

California State University, Chico
400 West First Street, Chico, CA 95929
Dr. Gayle E. Hutchinson, President
530.898.4636
www.csuchico.edu (<http://www.csuchico.edu>)

California State University, Dominguez Hills
1000 East Victoria Street, Carson, CA 90747
Dr. Willie Hagan, President
310.243.3696

www.csudh.edu (<http://www.csudh.edu>)

California State University, East Bay

25800 Carlos Bee Boulevard, Hayward, CA 94542

Dr. Leroy M. Morishita, President

510.885.3000

www.csueastbay.edu (<http://www.csueastbay.edu>)

California State University, Fresno

5241 North Maple Avenue, Fresno, CA 93740

Dr. Joseph I. Castro, President

559.278.4240

www.csufresno.edu (<http://www.csufresno.edu>)

California State University, Fullerton

800 N. State College Boulevard, Fullerton, CA 92831-3599

Mr. Framroze Virjee, President

657.278.2011

www.fullerton.edu (<http://www.fullerton.edu>)

Humboldt State University

1 Harpst Street, Arcata, CA 95521-8299

Dr. Lisa Roszbacher, President

707.826.3011

www.humboldt.edu (<http://www.humboldt.edu>)

California State University, Long Beach

1250 Bellflower Boulevard, Long Beach, CA 90840-0115

Dr. Jane Close Conoley, President

562.985.4111

www.csulb.edu (<http://www.csulb.edu>)

California State University, Los Angeles

5151 State University Drive, Los Angeles, CA 90032

Dr. William A. Covino, President

323.343.3000

www.calstatela.edu (<http://www.calstatela.edu>)

California Maritime Academy

200 Maritime Academy Drive, Vallejo, CA 94590

Rear Admiral Thomas A. Cropper, President

707.654.1000

www.csum.edu (<http://www.csum.edu>)

California State University, Monterey Bay

100 Campus Center, Seaside, CA 93955-8001

Dr. Eduardo M. Ochoa, President

831.582.3000

www.csumb.edu (<http://www.csumb.edu>)

California State University, Northridge

18111 Nordhoff Street, Northridge, CA 91330

Dr. Dianne F. Harrison, President

818.677.1200

www.csun.edu (<http://www.csun.edu>)

California State Polytechnic University, Pomona

3801 West Temple Avenue, Pomona, CA 91768

Dr. Soraya M. Coley, President

909.869.7659

www.cpp.edu (<http://www.cpp.edu>)

California State University, Sacramento

6000 J Street, Sacramento, CA 95819

Dr. Robert S. Nelson, President

916.278.6011

www.csus.edu (<http://www.csus.edu>)

California State University, San Bernardino

5500 University Parkway, San Bernardino, CA 92407-2318

Dr. Tomás D. Morales, President

909.537.5000

www.csusb.edu (<http://www.csusb.edu>)

San Diego State University

5500 Campanile Drive, San Diego, CA 92182

Ms. Sally Roush, President

619.594.5200

www.sdsu.edu (<http://www.sdsu.edu>)

San Francisco State University

1600 Holloway Avenue, San Francisco, CA 94132

Dr. Leslie E. Wong, President

415.338.1111

www.sfsu.edu (<http://www.sfsu.edu>)

San José State University

One Washington Square, San Jose, CA 95192-0001

Dr. Mary A. Papazian, President

408.924.1000

www.sjsu.edu (<http://www.sjsu.edu>)

California Polytechnic State University, San Luis Obispo

One Grand Avenue

San Luis Obispo, CA 93407

Dr. Jeffrey D. Armstrong, President

805.756.1111

www.calpoly.edu

California State University, San Marcos

333 South Twin Oaks Valley Road

San Marcos, CA 92096-0001

Dr. Karen S. Haynes, President

760.750.4000

www.csusm.edu (<http://www.csusm.edu>)

Sonoma State University

1801 East Cotati Avenue, Rohnert Park, CA 94928

Dr. Judy K. Sakaki, President

707.664.2880

www.sonoma.edu (<http://www.sonoma.edu>)

California State University, Stanislaus

One University Circle, Turlock, CA 95382

Dr. Ellen N. Junn, President

209.667.3122

www.csustan.edu (<http://www.csustan.edu>)

Average Support Cost per Full-time Equivalent Student Sources of Funds

The total support cost per full-time equivalent student (FTES) includes the expenditures for current operations, including payments made to students in the form of financial aid, and all fully reimbursed programs contained in state appropriations. The average support cost is determined by dividing the total cost by the number of FTES. The total CSU 2017/18 budget amounts were \$3,390,564,000 from state General Fund (GF) appropriations (not including GF debt service) and before adding \$39.3 million CalPERS retirement adjustment, \$2,477,015,000

from gross tuition revenue, and \$594,397,000 from other fee revenues for a total of \$6,461,976,000. The 2017/18 resident FTES target is 364,131 and the nonresident FTES based on past-year actual is 24,398 for a total of 388,529 FTES. The GF appropriation is applicable to resident students only whereas fee revenues are collected from resident and nonresident students. FTES is determined by dividing the total academic student load (e.g. 15 units per semester) (the figure used here to define a full-time student's academic load).

The 2017/18 average support cost per FTES based on GF appropriation and tuition revenue only is \$15,687 and when including all three sources as indicated below is \$17,217, which includes all fee revenue (e.g. tuition, application fees, and other campus mandatory fees) and debt service in the CSU Operating Fund. Of this amount, the average tuition and other fee revenue per FTES is \$7,905.

2017/18

	Amount	Average Cost Per FTES	%
State Appropriation (GF)*	3,390,564,000	9,311	54.1
Gross Tuition Revenue**	2,477,015,000	6,375	37.0
Other Fees Revenue**	594,397,000	1,530	8.9
Total Support Cost	6,461,976,000	17,217	100.0

* Represents state GF appropriation in the Budget Act of 2017/18; GF is divisible by resident students only (364,131 FTES).

** Represents CSU Operating Fund, gross tuition and other fees revenue amounts (net of tuition fee discounts) submitted in campus August 2017/18 final budgets. Revenues are divisible by resident and nonresident students (388,529 FTES).

The average CSU 2017/18 academic year, resident, undergraduate student basic tuition and other mandatory fees required to apply to, enroll in, or attend the university is \$7,216 (\$5,742 tuition fee plus \$1,474 average campus-based fees). However, the costs paid by individual students will vary depending on campus, program, and whether a student is part-time, full-time, resident, or nonresident.

Campus Smoking Policy

Please view the revised smoking policy for the Cal Poly campus implemented January 2, 2004 at <http://policy.calpoly.edu/cap/finalTOC.htm>.

Career Placement

The Career Services office 805.756.2501 may furnish, upon request, information about the employment of students who graduate from programs or courses of study preparing students for a particular career field. Any such data provided must be in a form that does not allow for the identification of any individual student. This information includes data concerning the average starting salary and the percentage of previously enrolled students who obtained employment or continued into graduate or professional schools. The information may include data collected from either graduates of the campus or graduates of all campuses in the California State University.

Civil and Criminal Penalties for Violation of Federal Copyrights Law

Anyone who is found to be liable for copyright infringement may be liable for either the owner's actual damages along with any profits of the infringer or statutory damages of up to \$30,000 per work infringed. In the case of a willful infringement, a court may award up to \$150,000 per work infringed. (See 17 U.S.C. §504.) Courts also have discretion to award costs and attorneys' fees to the prevailing party. (See 17 U.S.C. §505.) Willful copyright infringement can also result in criminal penalties, including imprisonment and fines. (See 17 U.S.C. §506 and 18 U.S.C. §2319.)

Determination of Residency for Nonresident Tuition Purposes

University requirements for establishing residency for tuition purpose are independent from those of other types of residency, such as for tax purposes, or other state or institutional residency. These regulations were promulgated not to determine whether a student is a resident or nonresident of California, but rather to determine whether a student should pay University fees on an in-state or out-of-state basis. A resident for tuition purposes is someone who meets the requirements set forth in the Uniform Student Residency Requirements. These laws governing residency for tuition purposes at the California State University (CSU) are California Education Code sections 68000-68085, 68120-68134, and 89705-89707.5, and California Code of Regulations, Title 5, Subchapter 5, Article 4, sections 41900-41916.

Residency material can be viewed on the Internet by accessing the CSU's website at www.calstate.edu/GC/resources.shtml (<http://www.calstate.edu/GC/resources.shtml>).

Each campus's Admissions Office is responsible for determining the residency status of all new and returning students based on the Application for Admission, Residency Questionnaire, Reclassification Request Form, and, as necessary, other evidence furnished by the student. A student who fails to submit adequate information to establish eligibility for resident classification will be classified as a nonresident.

Generally, establishing California residency for tuition purposes requires a combination of physical presence and intent to remain indefinitely. An adult who, at least 366 days prior to the residency determination date for the term in which enrollment is contemplated, can demonstrate physical presence in the state combined with evidence of intent to remain in California indefinitely, may establish California residency for tuition purposes. A minor normally derives residency from the parent(s) they reside with or most recently reside with.

Evidence demonstrating intent may vary from case to case but will include, and is not limited to, the absence of residential ties to any other state, California voter registration and voting in California elections, maintaining California registration and driver's license, maintaining active California bank accounts, filing California income tax returns and listing a California address on federal tax returns, owning residential property or occupying or renting an apartment where permanent belongings are kept, maintaining active memberships in California professional or social organizations, and maintaining a permanent military address and home of record in California.

Nonresident students seeking reclassification are required to complete a supplemental questionnaire that includes questions concerning their financial independence. Financial independence is required, along with

physical presence and intent, to be eligible for reclassification. Financial independence is established if in the calendar year the reclassification application is made and in any of the three calendar years preceding the reclassification application the student:

- has not and will not be claimed as an exemption for state and federal tax purposes by his/her parent;
- has not and will not receive more than seven hundred and fifty dollars (\$750) per year in financial assistance from his/her parent; and
- has not lived and will not live longer than six (6) weeks in the home of his/her parent.

A nonresident student who has been appointed as a graduate student teaching assistant, a graduate student research assistant, or a graduate student teaching associate on any CSU campus and is employed on a 0.49 or more time basis is exempt from the financial independence requirement.

Non-citizens establish residency in the same manner as citizens, unless precluded by the Immigration and Nationality Act from establishing domicile in the United States.

Exceptions to the general residency requirements are contained in California Education Code sections 68070-68085 and California Code of Regulations, Title 5, Subchapter 5, Article 4, sections 41906-41906.6, and include, but are not limited to, members of the military and their dependents, certain credentialed employees of school districts and most students who have attended three or more years of high school (grades 9-12) in California or attained credits earned in California from a California high school equivalent to three or more years of full-time high school coursework and a total of three or more years of attendance in California elementary schools, California secondary schools, or a combination of those schools, and graduated from a California high school or attained the equivalent of graduation. Whether an exception applies to a particular student cannot be determined before the submission of an application for admission and, as necessary, additional supporting documentation. Because neither campus nor Chancellor's Office staff may give advice on the application of these laws, applicants are strongly urged to review the material for themselves and consult with a legal advisor.

Residency determination dates

Term	Date
Fall	September 20
Winter	January 5
Spring	April 1
Summer	July 1

Students classified as non-residents may appeal a final campus decision within 120 days of notification by the campus. A campus residency classification appeal must be in writing and submitted to:

The California State University, Office of General Counsel,
401 Golden Shore, 4th Floor, Long Beach, CA 90802-4210

The Office of General Counsel can either decide the appeal or send the matter back to the campus for further review.

Students incorrectly classified as residents or incorrectly granted an exception from nonresident tuition are subject to reclassification as nonresidents and payment of nonresident tuition in arrears. If incorrect classification results from false or concealed facts, the student is also

subject to discipline pursuant to Section 41301 of Title 5 of the California Code of Regulations.

Resident students who become nonresidents or who no longer meet the criteria for an exception must immediately notify the Admissions Office.

Changes may have been made in the rate of nonresident tuition and in the statutes and regulations governing residency for tuition purposes in California between the time this information is published and the relevant residency determination date. Students are urged to review the statutes and regulations stated above.

**A proposal to change the contact information and notification period at the CSU Office of General Counsel is pending and will be available after March 2017.*

Higher Education Act (HEA)

Under the Higher Education Act of 1965 (HEA) and its many amendments, Cal Poly is required to make certain disclosures and institutional information "readily available" to prospective and enrolled students, employees, the general public and the department of education on an annual basis (20 U.S.C. Section 1092(a)). For additional information, please contact the Dean of Students Office at 805.756.0327.

Privacy Rights of Students in Education Records

https://registrar.calpoly.edu/ferpa_summary

The federal Family Educational Rights and Privacy Act (FERPA) of 1974 (20 U.S.C. 1232g) and regulations adopted thereunder (34 C.F.R. 99) set out requirements designed to protect students' privacy in their records maintained by the campus. The statute and regulations govern access to student records maintained by the campus and the release of such records. The law provides that the campus must give students access to most records directly related to the student, and must also provide opportunity for a hearing to challenge the records if the student claims they are inaccurate, misleading or otherwise inappropriate. The right to a hearing under this law does not include any right to challenge the appropriateness of a grade determined by the instructor. The law generally requires the institution to receive a student's written consent before releasing personally identifiable data about the student. The institution has adopted a set of policies and procedures governing implementation of the statute and the regulations. Copies of these policies and procedures may be obtained at the Office of Academic Records or the Educational Equity Services Office. Among the types of information included in the campus statement of policies and procedures are:

1. the types of student records maintained and the information they contain;
2. the official responsible for maintaining each type of record;
3. the location of access lists indicating persons requesting or receiving information from the record;
4. policies for reviewing and expunging records;
5. student access rights to their records;
6. the procedures for challenging the content of student records;
7. the cost to be charged for reproducing copies of records; and
8. the right of the student to file a complaint with the Department of Education.

The Department of Education has established an office and review board to investigate complaints and adjudicate violations. The designated

office is: Family Policy Compliance Office, U.S. Department of Education, 400 Maryland Avenue, SW, Washington, D.C. 20202-5920.

The campus is authorized under the Act to release "directory information" concerning students. "Directory information" may include the student's name, address, telephone listing, electronic mail address, photograph, date and place of birth, major field of study, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, grade level, enrollment status, degrees, honors, and awards received, and the most recent previous educational agency or institution attended by the student. The above-designated information is subject to release by the campus at any time unless the campus has received prior written objection from the student specifying what information the student requests not be released. Written objections should be sent to the University Registrar.

The campus is authorized to provide access to student records to campus officials and employees who have legitimate educational interests in such access. These persons have responsibilities in the campus' academic, administrative or service functions and have reason for accessing student records associated with their campus or other related academic responsibilities. Student records will be disclosed to the Chancellor's Office of the CSU in order to conduct research, to analyze trends, or to provide other administrative services on behalf of the CSU. Student records may also be disclosed to other persons or organizations under certain conditions (e.g., as part of the accreditation or program evaluation; in response to a court order or subpoena; in connection with financial aid; or to other institutions to which the student is transferring).

Completion/Graduation Rates

Information concerning completion, graduation rates and student body diversity at Cal Poly may be found at Institutional Planning and Analysis website http://ir.calpoly.edu/content/publications_reports/index; 805.756.2204.

Equity in Athletics Disclosure Act (EADA)

http://ir.calpoly.edu/content/publications_reports/ret_grad/index

The Equity in Athletics Disclosure Act requires co-educational institutions of postsecondary education that participate in a Title IV, federal student financial assistance program, and have an intercollegiate athletic program, to prepare an annual report to the Department of Education on athletic participation, staffing, and revenues and expenses, by men's and women's teams.

In compliance with this requirement, information contained in the current report for Cal Poly San Luis Obispo is available on the US Department of Education's web site at <http://ope.ed.gov/athletics> (select "Get data for one institution"). Alternatively, a link is also available to this and other publications through Cal Poly's Institutional Planning & Analysis web site (see link at top of this section). A paper copy of the report is available upon request.

Campus Security Report (Clery Act)

<http://afd.calpoly.edu/police/>

Crime statistics for Cal Poly are provided for all prospective and current students, faculty and staff on the website, along with critical updates and prevention advisories. These statistics are reported monthly to the Federal and State Departments of Justice as well as annually to the Office of the Chancellor of the CSU. Crime statistics are published to inform the campus community and to meet mandated reporting

requirements. A printed copy of the Campus Security Report is available by request at the University Police Department.

Student Activities

Information concerning student activities may be found at the Cal Poly Student Affairs website <http://www.studentaffairs.calpoly.edu/get-involved>; 805.756.5903.

Availability of Institutional and Financial Assistance Information

Student Financial Assistance. Director, Financial Aid, Admin. 212; 805.756.2927

1. A description of the federal, state, institutional, local, and private student financial assistance programs available to students who enroll at Cal Poly;
2. For each aid program, a description of procedures and forms by which students apply for assistance, student eligibility requirements, criteria for selecting recipients from the group of eligible applicants, and criteria for determining the amount of a student's award;
3. A description of the rights and responsibilities of students receiving financial assistance, including federal Title IV student assistance programs, and criteria for continued student eligibility under each program;
4. The satisfactory academic progress standards that students must maintain for the purpose of receiving financial assistance and criteria by which a student who has failed to maintain satisfactory progress may reestablish eligibility for financial assistance;
5. The method by which financial assistance disbursements will be made to students and the frequency of those disbursements;
6. The way the school provides for Pell-eligible students to obtain or purchase required books and supplies by the seventh day of a payment period and how the student may opt out;
7. The terms of any loan received as part of the student's financial aid package, a sample loan repayment schedule, and the necessity for repaying loans;
8. The general conditions and terms applicable to any employment provided as part of the student's financial aid package;
9. The terms and conditions of the loans students receive under the Direct Loan and Perkins Loan Programs;
10. The exit counseling information the school provides and collects for student borrowers; and
11. Contact information for ombuds offices available for disputes concerning federal, institutional and private loans.

Return of Federal Title IV student assistance funds. Director, Financial Aid, Admin. 212; 805.756.2927.

Cost of Attending Cal Poly. Director, Financial Aid, Admin. 212; 805.756.2927: fees and tuition (where applicable); the estimated costs of books and supplies; estimates of typical student room, board, and transportation costs; and, if requested, additional costs for specific programs.

Refund Policies. Assistant Director, Student Financial Services, Admin. 211; 805.756.1428: return of unearned tuition and fees or other refundable portions of institutional charges.

Facilities and Services available to Students with Disabilities. Director, Disability Resource Center, Student Services Bldg. 124; 805.756.1395.

Reporting Criminal Actions or Other Emergencies. University Police, Building 74; 805.756.2281.

Annual Fire Safety Report. Facility Services, Bldg. 80; 805.756.6662.

Prevention of Drug and Alcohol Abuse and Rehabilitation Programs. Office of the Vice President for Student Affairs, Admin. 209; 805.756.1521.

Grievance Procedures for Students. The Dean of Students Office, Bldg 124, Rm 125; 805.756.0327.

Teacher Certification Examinations, pass rates, teacher preparation programs. School of Education, Bldg 2, Rm 120; 805.756.2126.

Programs Leading to Licensure and Credentialing

Admission into programs leading to licensure and credentialing does not guarantee that students will obtain a license or credential. Licensure and credentialing requirements are set by agencies that are not controlled by or affiliated with the CSU and requirements can change at any time. For example, licensure or credentialing requirements can include evidence of the right to work in the United States (e.g., social security number or tax payer identification number) or successfully passing a criminal background check. Students are responsible for determining whether they can meet licensure or credentialing requirements. The CSU will not refund tuition, fees, or any associated costs, to students who determine subsequent to admission that they cannot meet licensure or credentialing requirements. Information concerning licensure and credentialing requirements are available from the Office of the Registrar, Admin. 222; 805.756.2531.

Military Selective Service Act

The federal Military Selective Service Act (the "Act") requires most males residing in the United States to present themselves for registration with the Selective Service System within thirty days of their eighteenth birthday. Most males between the ages of 18 and 25 must be registered. Males born after December 31, 1959 may be required to submit a statement of compliance with the Act and regulations in order to receive any grant, loan, or work assistance under specified provisions of existing federal law. In California, students subject to the Act who fail to register are also ineligible to receive any need-based student grants funded by the state or a public postsecondary institution. Selective Service registration forms are available at any U.S. Post Office, and many high schools have a staff member or teacher appointed as a Selective Service Registrar. Applicants for financial aid can also request that information provided on the Free Application for Federal Student Aid (FAFSA) be used to register them with the Selective Service. Information on the Selective Service System is available and the registration process may be initiated online at <http://www.sss.gov>.

Student Complaint Procedure (Complaints Regarding the CSU)

The California State University takes very seriously complaints and concerns regarding the institution. If you have a complaint regarding the CSU, you may present your complaint as follows:

1. If your complaint concerns CSU's compliance with academic program quality and accrediting standards, you may present your complaint to the Western Association of Schools and Colleges (WASC) at www.wascsenior.org/comments (<http://www.wascsenior.org/>

comments). WASC is the agency that accredits the CSU's academic program. If you believe that your complaint warrants further attention after you have exhausted all the steps outlined by WASC, you may file an appeal with the Assistant Vice Chancellor, Academic and Student Affairs at the CSU Chancellor's Office.

2. If your complaint concerns an alleged violation by CSU of any law that prohibits discrimination, harassment or retaliation based on a protected status (such as age, disability, gender (or sex), gender identity, gender expression, nationality, race or ethnicity (including color or ancestry), religion or veteran or military status), you may present your complaint as described in Section XVI (Nondiscrimination Policy).
3. If your complaint concerns an alleged violation by CSU of other state law, including laws prohibiting fraud and false advertising, you may present your complaint to the campus president or designee at (Jessica Darin, Chief of Staff, darin@calpoly.edu). See Procedure for Student Complaints—Executive Order No. 1063 for details regarding the complaint requirements and complaint process: <http://www.calstate.edu/eo/eo-1063.html>.
4. Other complaints regarding the CSU may be presented to the campus dean of students, who will provide guidance on the appropriate campus process for addressing your particular issue.

This procedure should not be construed to limit any right that you may have to take legal action to resolve your complaint.

Student Conduct

Inappropriate conduct by students or by applicants for admission is subject to discipline as provided in Sections 41301 through 41304 of Title 5, *California Code of Regulations*. These sections are:

41301. Standards for Student Conduct.

1. Campus Community Values

The University is committed to maintaining a safe and healthy living and learning environment for students, faculty, and staff. Each member of the campus community should choose behaviors that contribute toward this end. Students are expected to be good citizens and to engage in responsible behaviors that reflect well upon their university, to be civil to one another and to others in the campus community, and contribute positively to student and university life.

2. Grounds for Student Discipline

Student behavior that is not consistent with the Student Conduct Code is addressed through an educational process that is designed to promote safety and good citizenship and, when necessary, impose appropriate consequences. The following are the grounds upon which student discipline can be based:

- a. Dishonesty, including:
 - i Cheating, plagiarism, or other forms of academic dishonesty that are intended to gain unfair academic advantage.
 - ii Furnishing false information to a University official, faculty member, or campus office.
 - iii Forgery, alteration, or misuse of a University document, key, or identification instrument.
 - iv Misrepresenting one's self to be an authorized agent of the University or one of its auxiliaries.
- b. Unauthorized entry into, presence in, use of, or misuse of University property.

- c. Willful, material and substantial disruption or obstruction of a University-related activity, or any on-campus activity.
 - d. Participating in an activity that substantially and materially disrupts the normal operations of the University, or infringes on the rights of members of the University community.
 - e. Willful, material and substantial obstruction of the free flow of pedestrian or other traffic, on or leading to campus property or an off-campus University related activity.
 - f. Disorderly, lewd, indecent, or obscene behavior at a University related activity, or directed toward a member of the University community.
 - g. Conduct that threatens or endangers the health or safety of any person within or related to the University community, including physical abuse, threats, intimidation, harassment, or sexual misconduct.
 - h. Hazing, or conspiracy to haze. Hazing is defined as any method of initiation or pre-initiation into a student organization or student body, whether or not the organization or body is officially recognized by an educational institution, which is likely to cause serious bodily injury to any former, current, or prospective student of any school, community college, college, university or other educational institution in this state (Penal Code 245.6), and in addition, any act likely to cause physical harm, personal degradation or disgrace resulting in physical or mental harm, to any former, current, or prospective student of any school, community college, university, or other educational institution. The term "hazing" does not include customary athletic events or school sanction events.
Neither the express or implied consent of a victim of hazing, nor the lack of active participation in a particular hazing incident is a defense. Apathy or acquiescence in the presence of hazing is not a neutral act, and is also a violation of this section.
 - i. Use, possession, manufacture, or distribution of illegal drugs or drug-related paraphernalia, (except as expressly permitted by law and University regulations) or the misuse of legal pharmaceutical drugs.
 - j. Use, possession, manufacture, or distribution of alcoholic beverages (except as expressly permitted by law and University regulations), or public intoxication while on campus or at a University related activity.
 - k. Theft of property or services from the University community, or misappropriation of University resources.
 - l. Unauthorized destruction, or damage to University property or other property in the University community.
 - m. Possession or misuse of firearms or guns, replicas, ammunition, explosives, fireworks, knives, other weapons, or dangerous chemicals (without the prior authorization of the campus president) on campus or at a University related activity.
 - n. Unauthorized recording, dissemination, or publication of academic presentations (including handwritten notes) for a commercial purpose.
 - o. Misuse of computer facilities or resources, including:
 - i. Unauthorized entry into a file, for any purpose.
 - ii. Unauthorized transfer of a file.
 - iii. Use of another's identification or password.
 - iv. Use of computing facilities, campus network, or other resources to interfere with the work of another member of the University community.
 - v. Use of computing facilities and resources to send obscene or intimidating and abusive messages.
 - vi. Use of computing facilities and resources to interfere with normal University operations.
 - vii. Use of computing facilities and resources in violation of copyright laws.
 - viii. Violation of a campus computer use policy.
 - p. Violation of any published University policy, rule, regulation or presidential order.
 - q. Failure to comply with directions of, or interference with, any University official or any public safety officer while acting in the performance of his/her duties.
 - r. Any act chargeable as a violation of a federal, state, or local law that poses a substantial threat to the safety or well-being of members of the University community, to property within the University community or poses a significant threat of disruption or interference with University operations.
 - s. Violation of the Student Conduct Procedures, including:
 - i. Falsification, distortion, or misrepresentation of information related to a student discipline matter.
 - ii. Disruption or interference with the orderly progress of a student discipline proceeding.
 - iii. Initiation of a student discipline proceeding in bad faith.
 - iv. Attempting to discourage another from participating in the student discipline matter.
 - v. Attempting to influence the impartiality of any participant in a student discipline matter.
 - vi. Verbal or physical harassment or intimidation of any participant in a student discipline matter.
 - vii. Failure to comply with the sanction(s) imposed under a student discipline proceeding.
 - t. Encouraging, permitting, or assisting another to do any act that could subject him or her to discipline.
- 3. Procedures for Enforcing this Code**
The Chancellor shall adopt procedures to ensure students are afforded appropriate notice and an opportunity to be heard before the University imposes any sanction for a violation of the Student Conduct Code. **[Note:** At the time of publication, such procedures are set forth in California State University Executive Order 1098 (Revised June 23, 2015), available at <http://calstate.edu/eo/EO-1098-rev-6-23-15.html>.]
- 4. Application of this Code**
Sanctions for the conduct listed above can be imposed on applicants, enrolled students, students between academic terms, graduates awaiting degrees, and students who withdraw from school while a disciplinary matter is pending. Conduct that threatens the safety or security of the campus community, or substantially disrupts the functions or operation of the University is within the jurisdiction of this Article regardless of whether it occurs on or off campus. Nothing in this Code may conflict with Education Code section 66301 that prohibits disciplinary action against students based on behavior protected by the First Amendment.
- 41302. Disposition of Fees: Campus Emergency; Interim Suspension.**
The President of the campus may place on probation, suspend, or expel a student for one or more of the causes enumerated in Section 41301. No fees or tuition paid by or for such student for the semester,

quarter, or summer session in which he or she is suspended or expelled shall be refunded. If the student is readmitted before the close of the semester, quarter, or summer session in which he or she is suspended, no additional tuition or fees shall be required of the student on account of the suspension.

During periods of campus emergency, as determined by the President of the individual campus, the President may, after consultation with the Chancellor, place into immediate effect any emergency regulations, procedures, and other measures deemed necessary or appropriate to meet the emergency, safe-guard persons and property, and maintain educational activities.

The President may immediately impose an interim suspension in all cases which there is reasonable cause to believe that such an immediate suspension is required in order to protect lives or property and to insure the maintenance of order. A student so placed on interim suspension shall be given prompt notice of charges and the opportunity for a hearing within 10 days of the imposition of interim suspension.

During the period of interim suspension, the student shall not, without prior written permission of the President or designated representative, enter any campus of the California State University other than to attend the hearing. Violation of any condition of interim suspension shall be grounds for expulsion.

Use of Social Security Number

Applicants are required to include their correct social security numbers in designated places on applications for admission pursuant to the authority contained in Section 41201, Title 5, *California Code of Regulations*, and Section 6109 of the Internal Revenue Code (26 U.S.C. 6109). The University uses the social security number to identify students and their records including identification for purposes of financial aid eligibility and disbursement and the repayment of financial aid and other debts payable to the institution. Also, the Internal Revenue Service (IRS) requires the University to file information returns that include the student's social security number and other information such as the amount paid for qualified tuition, related expenses, and interest on educational loans. This information is used by the IRS to help determine whether a student, or a person claiming a student as a dependent, may take a credit or deduction to reduce federal income taxes.

UPDATES TO THE CATALOG

Effective Summer 2017 through Spring 2019:

Listed below are updates to the 2017-19 catalog. This includes new courses, course changes, corrections, and curriculum substitutions.

- New courses and course changes are the result of the Exceptions to the Catalog Review Cycle process.
- Corrections have been identified since the publication of the 2017-19 catalog.
- Curriculum substitutions are the result of approved blanket curriculum substitutions.
- For updates to other information in the Catalog, please see the appropriate web sites (e.g., Admissions, Office of the Registrar - Records and Evaluations, Financial Aid, Housing, etc.).

Item	Change Description	Date of Update or Effective Term
Academic Minors Policy	Added, "For the French, German, and Spanish minors, the requirement for students studying abroad is at least one third of the units must be taken at Cal Poly; this allowance is for study abroad programs only and does not apply to any domestic transfer credit" to "At least half of the units must be taken at Cal Poly (in residence)" section.	9/25/17
AERO 320	Add Corequisite: AERO 321.	Winter 2018
AERO 321	Removed prerequisite "EE 201 and EE 251".	Summer 2017
Admissions	Added "The California Promise Program" description to Undergraduate Admissions section.	6/2/17
AG 210	New course.	Spring 2018
AG 212	New course.	Spring 2018
AG 254	New course.	Spring 2018
AG 410	New course.	Spring 2018
AG 412	New course.	Spring 2018
AG 413	New course.	Spring 2018
AG 454	New course.	Spring 2018
AGB 318	Change prerequisite from "AGB 301 and AGB 312" to "AGB 301".	Spring 2018
AGB 326	Change prerequisite from "AGB 324" to "AGB 308 or AGB 310".	Spring 2018

AGB 410	Change prerequisite from "AGB 301; AGB 308 or AGB 310; AGB 312; AGB 313; AGB 323; and one of the following: AGB 327, AGB 328, AGB 405, AGB 421, AGB 422, AGB 433, or AGB 435" to "AGB 308 or AGB 310; and AGB 323.	Winter 2018
AGB 452	Change prerequisite from "AGB 313; and AGB 327 or AGB 328" to "AGB 313".	Winter 2018
Agribusiness Minor	Add Request for Approved Electives: Replaced individual courses from Approved Electives list with the statement, "Any AGB course except AGB 101".	7/14/17
AGED 438	Removed from catalog due to course being inactivated effective Summer 2017.	Summer 2018
Agricultural Communication, BS	Curriculum substitution: In major coursework, change requirement from "AGC 339 or AG 339" to "AGC 339 or AG 339 or AGED 339".	10/19/18
Agricultural Leadership Minor	New minor.	Fall 2018
Agricultural Science, BS	Clarifying language was added and formatting changes were made to the Career Area approved electives.	8/18/17
Agricultural Science, BS	Included information, "that is not already counting towards GE area" to Individualized Career Area Elective.	4/28/17
Agricultural Systems Management, BS	Curriculum substitution: In major coursework, add footnote to BRAE 462, "May substitute 2 units of any upper-division courses not used to satisfy the requirement in the major".	8/22/18

Animal Science, BS	Add Request for Approved Electives: Added the following electives to the Approved Electives Guide: AGB 202, AGB 314, AGB 369, ASCI 270, ASCI 412, ASCI 413, ASCI 470, BIO 308, BIO 405, BOT 121, BOT 313, BRAE 141, DSCI 401, PHYS 125, POLS 338, POLS 351, PSY 340, and STAT 313.	9/27/17
Architectural Engineering, MS	Correction: Removed CRP 513, changed ARCE 551 from "5" units to "10" and changed Approved Electives from "12" to "11" units.	1/29/18
Art and Design, BFA	Curriculum substitution: In Studio Art concentration required coursework, change requirement from "ART 448" to "ART 448 or ART 353".	3/22/18
ART 315	Change prerequisite from "ART 112 or ART 213; and Junior standing" to "ART 112 or ART 211 or ART 212 or ART 213; and Junior standing".	Winter 2018
BIO 301	New course.	Spring 2018
Biological Sciences, BS	Add Request for Approved Electives: In Anatomy and Physiology Concentration, Molecular and Cellular Biology Concentration and General Curriculum; added CHEM 418 to Approved Electives list.	10/30/17
Biological Sciences, BS	Add Request for Approved Electives: In Anatomy and Physiology Concentration, added BIO 470 topic "Gastrointestinal Physiology & Microbiology" to Department Electives and Approved Electives list.	10/11/17

Biological Sciences, BS	Clarifying language was added and formatting changes were made to the following programs: General Curriculum in Biology, Anatomy and Physiology concentration, Ecology concentration, Molecular and Cellular Biology, and Wildlife and Biodiversity Conservation concentration.	10/2/17
-------------------------	---	---------

Biomedical Engineering, BS	Curriculum substitution: In major coursework, add footnote to BMED 455 & BMED 456, "ENGR 459, ENGR 460, ENGR 461 and BMED 400 (8) may substitute for BMED 455 and BMED 456 (8)".	3/29/17
----------------------------	--	---------

Biomedical Engineering, BS	Change prerequisite from "BMED 455 (4) and BMED 456 (4); or ENGR 459 (2), ENGR 460 (2), ENGR 461 (2), and BMED 400 (2)" to "BMED 455 (4) and BMED 456 (4); or ENGR 459 (2), ENGR 460 (2), ENGR 461 (2), and BMED 400 (2); or ENGR 463 (2), ENGR 464 (2), ENGR 465 (2), and BMED 400 (2)".	6/19/18
----------------------------	---	---------

BioResource and Agricultural Engineering	Curriculum substitution: In major coursework, add footnote to BRAE 462, "May substitute 2 units of any upper-division courses not used to satisfy the requirement in the major".	8/22/18
--	--	---------

BMED 310	Change prerequisite from "EE 201; and CPE/CSC 101, CSC 231, or CSC 234" to "EE 201; and CPE/CSC 101, CSC 231, CSC 232, or CSC 234"	Winter 2018
----------	--	-------------

BMED 410 Change prerequisite from "BMED 310, CE 204, and ME 212" to "BMED 310, CE 204, and ME 212". Add corequisite "BMED 310". Spring 2018

BMED 410 Correct prerequisite from "BMED, CE 204, or ME 212" to "BMED 310, CE 204, and ME 212". 5/15/17

BMED 420 Change prerequisite from "BMED 310, CE 204, and MATE 310" to "CE 204 and MATE 210". Add corequisite "BMED 310". Spring 2018

BMED 422 New course. Spring 2018

BMED 425 Correct prerequisite from "ME 302 or ME 341" to "ME 302 and ME 341". 5/15/17

BMED 440 Correct prerequisite from "BMED 310 or EE 201" to "BMED 310 and EE 201". 5/15/17

BMED 481 Correct prerequisite from "IME 314, MATH 244 or ME 302" to "IME 314, MATH 244 and ME 302". 5/15/17

BMED 510 Change prerequisite from "An upper division course in physiology" to "one of the following: ASCI 438, BIO 361, or BMED 460; or graduate standing." Summer 2018

BRAE 151 Remove prerequisite "BRAE 133 or equivalent". Spring 2018

BRAE 450 Change prerequisite from "PHYS 104 or PHYS 118 or PHYS 121 or PHYS 141; and junior standing" to "one of the following: PHYS 104; PHYS 118; PHYS 121; or PHYS 141; and junior standing". Add EE 450 crosslisting. Spring 2018

BUS 391 Change prerequisite from "BUS 214" to "BUS 212 or BUS 214 for Industrial Technology and Packaging majors; BUS 214 for all other majors". Winter 2018

BUS 402 Correct prerequisite from "BUS 342, BUS 346, or BUS 387" to "BUS 342, BUS 346, and BUS 387". 5/15/17

BUS 458 New course. Summer 2018

Business Administration, BS Add Request for Approved Electives: In Financial Management Concentration moved BUS 448 to list above Approved Electives. 4/6/18

Business Administration, BS Add Request for Approved Electives: In Financial Management Concentration added BUS 448 to Approved Electives list. 2/20/18

CD 230 Correct prerequisite from "CD 131 or PSY 256" to "CD 131 and PSY 256". 5/15/17

CD 401 Correct prerequisite from "Senior standing; and one of the following: CD 304, CD 305, CD 306, or CD 329" to "CD 304, CD 305, CD 306, CD 329 and senior standing". 5/15/17

CE 113 Remove prerequisite "ENVE 111 or CE 112 (may be taken concurrently)." Summer 2018

CE 500 Added "Total credit limit to 4 units" to course description". Fall 2017

City and Regional Planning Minor Add Request for Approved Electives: Added CRP 426. 7/20/17

CHEM 106 Update prerequisite from "Passing score on ELM examination, or an ELM exemption, or MATH 104" to "Passing score on ELM examination, or an ELM exemption, or MATH 96 (formerly MATH 104)". 5/16/16

CHEM 106	Change prerequisite from "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level."	Fall 2018
CHEM 110	Update prerequisite from "Passing score on ELM examination, or an ELM exemption, or MATH 104" to "Passing score on ELM examination, or an ELM exemption, or MATH 96 (formerly MATH 104)".	5/16/17
CHEM 110	Change prerequisite from "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level."	Fall 2018
CHEM 111	Change prerequisite from "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level."	Fall 2018
CHEM 124	Update prerequisite from "Passing score on ELM examination, or an ELM exemption, or credit in MATH 104" to "Passing score on ELM examination, or an ELM exemption, or credit in MATH 96 (formerly MATH 104)".	5/16/17

CHEM 124	Change prerequisite from "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level."	Fall 2018
CHEM 127	Update prerequisite from "Passing score on ELM examination, or an ELM exemption, or credit in MATH 104" to "Passing score on ELM examination, or an ELM exemption, or credit in MATH 96 (formerly MATH 104)".	5/16/17
CHEM 127	Change prerequisite from "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level."	Fall 2018
Child Development, BS	Curriculum substitution: In support coursework, change requirement from "BIO 302" to "BIO 302 or PSY 344".	11/8/18
Civil Engineering, BS	Add Request for Approved Engineering Science Electives: Added CM 280.	2/8/18
Civil Engineering, BS	Department is removing ME 302 as a required support course.	6/11/18
CM 280	Change prerequisite from "CE 115" to "CM 113 or CE 115".	Summer 2018
CM 280	Remove corequisite "CM 313".	Spring 2018
CM 415	Added "Not open to students with credit in CM 450" to course description.	Summer 2017

Computer Engineering, BS	Add Request for Approved Technical Electives: Added DATA 301.	Summer 2017
Computer Engineering, BS	Curriculum substitution: In major coursework, add footnote to CPE 350 & CPE 450, "ENGR 459, ENGR 460, ENGR 461, and CPE 400 (7) or ENGR 463, ENGR 464, ENGR 465, and CPE 400 (7) may substitute for CPE 350 and CPE 450 (7)."	9/4/2018
CPE 419	Correct corequisite from "CSC 348" to "CSC 141 or CSC 348".	5/15/17
CPE/CSC 431	Correct prerequisite from "CSC/CPE 430" to "CSC 430".	6/27/17
CRP 338	Added "Course may be offered in classroom-based or online format" to course description.	Winter 2019
CSC 307	Correct prerequisite from "CSC 348 and CPE/CSC 357" to "CSC 141 or CSC 348; and CPE/CSC 357".	5/15/17
CSC 308	Correct prerequisite from "CSC 348 and CPE/CSC 357" to "CSC 141 or CSC 348; and CPE/CSC 357".	5/15/17
CSC 344	Correct prerequisite from "CSC 348 and CPE/CSC 357" to "CSC 141 or CSC 348; and CPE/CSC 357".	5/15/17
CSC 349	Correct prerequisite from "CSC 348 and MATH 142; or CPE/CSC 102 and CPE/CSC 103 and MATH 248; or CPE/CSC 202 and CPE/CSC 203 and MATH 248" to "CSC 141 and MATH 142; or CSC 348 and MATH 142; or CPE/CSC 102 and CPE/CSC 103 and MATH 248; or CPE/CSC 202 and CPE/CSC 203 and MATH 248".	5/15/17

CSC 365	Correct prerequisite from "CSC 348; or CPE/CSC 102 and CPE/CSC 103 and MATH 248; or CPE/CSC 202 and CPE/CSC 203 and MATH 248" to "CSC 141; or CSC 348; or CPE/CSC 102 and CPE/CSC 103 and MATH 248; or CPE/CSC 202 and CPE/CSC 203 and MATH 248".	5/15/17
---------	---	---------

CSC/CPE 101	Change prerequisite from "Completion of ELM requirement, and passing score on MAPE or MATH 117 with a grade of C- or better or MATH 118 with a grade of C- or better, or consent of instructor" to "Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 117 with a grade of C- or better; or MATH 118 with a grade of C- or better; or consent of instructor."	Fall 2018
Curriculum and Instruction, MA	New graduate degree program.	Fall 2018
Dairy Products Technology, MPS	Changed the IELTS score from "6.0" to "6.5".	11/6/17
EDUC 416	Added "Course may be offered in classroom-based or online format" to course description.	Summer 2018
EDUC 450	Remove "Corequisite: EDUC 454 or EDUC 456".	Winter 2018
EDUC 587	Added "Course may be offered in classroom-based or online format" to course description.	Summer 2018
Educational Leadership and Administration, MA	New graduate degree program.	Fall 2018
EE 201	Add "Course may be offered in classroom-based or online format" to course description.	Summer 2017
EE 271	New course.	Winter 2019

Electrical Engineering, Blended BS + MS	Updated information on the Program of Study.	5/24/18
Electrical Engineering, BS	Add Request for Approved Technical Electives: Added EE/ BRAE 450.	3/21/18
Electrical Engineering, BS	Add Request for Approved Electives: Added EE/PHYS 422 to Engineering Support Electives.	7/18/17
Electrical Engineering, BS	Curriculum substitution: In major coursework, add footnote to EE 460, "ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for the series EE 460, EE 461 and EE 462 (6) or the series EE 460, EE 463 and EE 464 (6)".	5/3/17
ENGL 129	New course.	Fall 2018
ENGL 130	New course.	Fall 2018
ENGL 131	New course.	Fall 2018
ENGL 132	New course.	Fall 2018
ENGL 133	Change prerequisite from "satisfactory score on the English Placement Test" to "satisfactory score on the English Placement Test or GE A1 eligibility for Written Communication Placement upon admissions."	Fall 2018
ENGL 134	Change prerequisite from "satisfactory score on the English Placement Test" to "satisfactory score on the English Placement Test or GE A1 eligibility for Written Communication Placement upon admissions."	Fall 2018
ENGL 135	New course.	Fall 2018
ENGL 242	Add HNRS 242 as crosslisted course.	Winter 2018
English, BA and MA	Added blended program.	Fall 2018
English Minor	Add Request for Approved Electives: Added ENGL 370.	2/6/18
ENVE 325	Remove "Recommended: ENVE 264".	Spring 2018

Environmental Earth and Soil Sciences, BS	Add "or GEOG 308" as alternate major course requirement to "GEOG 301".	5/22/18
ERSC/SS 400	Correction: Removed NR crosslisting and updated total credit limit from "4 units" to "12 units".	5/16/17
ES 243	Add "Course may be offered in classroom-based or online format" to course description.	Summer 2018
ESM 90	Change prerequisite from "Appropriate score on the ELM examination" to "Appropriate score on the ELM examination or appropriate Math Placement Level."	Fall 2018
Ethnic Studies Minor	Update footnote #2 from "Approved electives include courses listed above not used to meet minor requirements, and list of approved electives for Comparative Ethnic Studies majors" to "Approved electives include courses listed above not used to meet minor requirements, any unused ES prefix course, or any course on the list of approved electives for Comparative Ethnic Studies majors."	9/21/18
Faculty and Staff Emerti	Changed "served at least fifteen years of full-time" to "served at least ten years of full-time".	6/7/18
Food Science, BS	Curriculum substitution: In Applied Food Technology concentration required coursework, change requirement from "FSN 410" to "FSN 341 or FSN 410". Added footnote "FSN 341 may not be double-counted as an approved elective".	5/17/17

Forestry and Natural Resources, BS	Curriculum substitution: In support coursework, change requirement from "BRAE/NR 247" or BRAE 239" to "BRAE/ NR 247" or BRAE 237 or BRAE 239".	3/12/18
---------------------------------------	---	---------

GE Area A	<p>"C- or better" was added to GE Area A in the prerequisite for the courses listed below to be consistent with EO 1100: AEPS 461; AG 330, 350; AGC 426; ANT 325, 330, 344, 345, 360, 393, 402, 425, 460; ARCH 320, 326, 445; ART 311, 314, 318, 370, 371; BRAE 418, 460; BUS 302, 310, 311, 313, 382, 384, 387, 389; COMS 126, 145, 201, 208, 212, 213, 217, 226, 250, 301, 308, 311, 315, 316, 317, 319, 322, 330, 331, 385, 386, 390, 395, 418, 419, 420, 421, 422, 428, 470; CRP 304, 325, 334, 402, 426; DANC 321; ECON 303, 304, 325; EDES 350; ENGL 145, 148, 149, 150, 202, 203, 221, 230, 231, 241, 242, 251, 252, 253, 260, 290, 302, 310, 317, 319, 330, 331, 332, 333, 334, 335, 339, 340, 341, 342, 343, 345, 346, 347, 349, 350, 351, 352, 354, 361, 365, 370, 371, 372, 380, 381, 382, 386, 387, 388, 390, 391, 395, 411, 424, 467; ENGR 310, 350; ERSC 476, 477, 478, 479; ES 300, 308, 310, 320, 321, 322, 323, 326, 330, 335, 340, 345, 351, 360, 380, 381, 390; FR 233, 305, 350; FSN 461; GEOG 300, 301, 308, 350, 370, 380; GER 233, 305, 350; HIST 303, 306, 307, 308, 309, 310, 316, 317, 318, 319, 320, 321, 322, 324, 326, 334, 335, 336, 337, 338, 350, 407; HNRS 145, 148, 149, 230, 231, 232, 242, 251, 303, 304, 312, 317, 320, 321, 323, 324, 332, 333, 334, 335, 336, 340, 341, 342, 343, 345, 347, 352, 380, 391, 411; ISLA 303, 315, 316, 320, 330, 350, 393, 456, 470; ITP 302; JOUR 331, 333, 418; KINE 266, 278, 320, 323, 324, 460, 461, 462; LAES 301; LS 260,</p>	Winter 2018
-----------	--	-------------

	<p>310; ME 320; MSCI 440; MU 320, 324, 328; NR 308, 323, 324, 360, 412, 476, 477, 478, 479; PHIL 126, 230, 231, 241, 285, 309, 310, 312, 313, 314, 315, 317, 318, 319, 320, 321, 322, 323, 327, 328, 331, 332, 333, 334, 335, 336, 337, 339, 340, 341, 342, 343, 350, 351, 369; POLS 325, 337, 338, 339, 348, 349, 380; PSC 391; PSY 212, 304, 311, 318, 352; RELS 301, 302, 304, 306, 307, 310, 311, 344, 370, 372, 374, 378, 380; SCM 301, 350; SOC 315, 326, 327, 377; SPAN 233, 303, 305, 307, 340, 350, 351; STAT 365; TH 305, 350, 360, 390; UNIV 321, 330, 350, 391; WGS 301, 302, 320, 336, 340, 345, 351, 370 ; WLC 310, 312, 370</p>	
GRC 318	Change prerequisite from "Junior standing and GRC 301" to "Junior standing; GRC 203; and GRC 301".	Winter 2018
History, MA	Updated program learning objectives.	8/8/18
HIST 201	Add HNRS 203 as crosslisted course.	Fall 2018
HIST 202	Add HNRS 202 as crosslisted course.	Fall 2018
HIST 307	Change prerequisite from "Junior standing; completion of GE Area A with a grade of C- or better; and one course from D1, D2 or D3" to "Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from GE Area D1, D2 or D3".	Summer 2018

HIST 309	Change prerequisite from "Junior standing; completion of GE Area A with a grade of C- or better; and one course from Area D2 or D3" to "Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from GE Area D2 or D3".	Summer 2018
HIST 318	Change prerequisite from "Junior standing; completion of GE Area A with a grade of C- or better; and one course from Area D2 or D3" to "Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from GE Area D2 or D3".	Summer 2018
HIST 321	Change prerequisite from "Junior standing; and completion of GE Area A with a grade of C- or better; and GE Area D1" to "Junior standing or History major; completion of GE Area A with a grade of C- or better; and GE Area D1".	Summer 2018
HIST 334	Change prerequisite from "Junior standing; completion of GE Area A with a grade of C- or better; and two courses from Area D1, D2 or D3" to "Junior standing or History major; completion of GE Area A with a grade of C- or better; and two courses from GE Area D1, D2 or D3".	Summer 2018

HIST 335	Change prerequisite from "Junior standing; completion of GE Area A with a grade of C- or better; and two courses from Area D1, D2 or D3" to "Junior standing or History major; completion of GE Area A with a grade of C- or better; and two courses from GE Area D1, D2 or D3".	Summer 2018
HIST 350	Add HNRS 350 as crosslisted course.	Winter 2018
HIST 421	Change prerequisite from "HIST 303 or completion of GE Area D5, or graduate standing" to "HIST 303; completion of GE Area D5; or graduate standing". Add WGS 421 crosslisting.	Summer 2018
HIST 460	Correction: Removed "Schedule of Classes will list topic area selected" in course description.	7/21/17
HIST 461	Correction: Removed "Schedule of Classes will list topic area selected" in course description.	7/21/17
Higher Education Counseling and Student Affairs, MS	New graduate degree program.	Fall 2018
HLTH 101	New course.	Fall 2017
HLTH 299	New course.	Fall 2017
HLTH 310	Change prerequisite from "KINE 265" to "HLTH/KINE 265"	Summer 2018
HLTH 310	New course.	Fall 2017
HLTH 334	New course.	Fall 2017
HLTH 402	New course.	Fall 2017
HLTH 405	New course.	Fall 2017
HLTH 410	New course.	Fall 2017
HLTH 460	New course.	Fall 2017
HLTH 461	New course.	Fall 2017
HLTH 462	New course.	Fall 2017
HLTH 463	New course.	Fall 2017
IME 424	New course.	Winter 2018

IME 432	Change requisite from "IME 144; IME 330, and MATE 210. Recommended: ME 251" to "IME 144 or ME 251; and MATE 210. Recommended: IME 330".	Spring 2018
Industrial and Manufacturing Engineering, BS	Add request for approved electives: added IME 460 (3).	6/14/18
Industrial Engineering, BS	Curriculum substitution: In major coursework, add footnote to IME 481 & IME 482, "ENGR 463, ENGR 464 and ENGR 465 (6) may substitute for IME 481 and IME 482 (5) with the one excess unit counting towards Technical Electives".	12/8/17
Industrial Engineering, BS	Curriculum substitution: In major coursework, add footnote to IME 481 & IME 482, "ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for IME 481 and IME 482 (5) with the one excess unit counting towards Technical Electives".	3/15/17
Industrial Technology and Packaging, BS	Added footnote, "STAT 302 is not a GE course. All students must complete two approved GE B1 courses" to STAT 217 or STAT 218 or STAT 251 or STAT 302 requirement.	10/12/17
Interdisciplinary Studies, BA	Change from self-support to state-support.	Fall 2018
ISLA 201	New course.	Fall 2018
ISLA 355	New course.	Fall 2018
ISLA 440	New course.	Fall 2018
ISLA 461	New course.	Fall 2018
ITP 330	Change prerequisite from "Junior standing" to "Junior standing or Industrial Technology and Packaging major".	Summer 2018
ITP 341	Change prerequisite from "Junior standing" to "Junior standing or Industrial Technology and Packaging major".	Summer 2018
JOUR 304	Change prerequisite from "JOUR 233 or JOUR 342" to "JOUR 203".	Summer 2018
JOUR 378	New course.	Winter 2019
JOUR 385	New course.	Winter 2019
JOUR 403	New course.	Summer 2018
KINE 129	Change course description.	Winter 2018
KINE 129	Reactivate course in the catalog.	Fall 2017
KINE 131	Change course title from "Group Fitness Combine" to "Group Fitness Cardio/Strength". Change course description.	Winter 2018
KINE 131	Reactivate course in the catalog.	Fall 2017
KINE 143	Change course description.	Winter 2018
KINE 143	Reactivate course in the catalog.	Fall 2017
KINE 144	Change course title from "Swimming:Advanced Beginner" to "Beginning Swimming". Change course description.	Winter 2018
KINE 144	Reactivate course in the catalog.	Fall 2017
KINE 145	Change course description.	Winter 2018
KINE 145	Reactivate course in the catalog.	Fall 2017
KINE 147	Change course title from "Swim Conditioning" to "Advanced Swimming and Conditioning". Change course description.	Winter 2018
KINE 154	Change course description.	Winter 2018
KINE 154	Reactivate course in the catalog.	Fall 2017
KINE 250	Add "Course may be offered in classroom-based or online format" to course description. Add HLTH 250 as crosslisted course.	Spring 2018

KINE 255	Add HLTH 255 as crosslisted course.	Spring 2018
KINE 255	Added "Course may be offered in classroom-based or online format" to course description.	Summer 2018
KINE 260	Added "Course may be offered in classroom-based or online format" to course description.	Winter 2019
KINE 260	Add HLTH 260 as crosslisted course.	Spring 2018
KINE 265	Change prerequisite from "KINE 180; and one of the following: KINE 250, KINE 255 or KINE 260" to "HLTH 101 or KINE 180; and one of the following: HLTH/KINE 250; HLTH/KINE 255; or HLTH/KINE 260". Add HLTH 265 as crosslisted course.	Spring 2018
KINE 280	Change prerequisite from "KINE 250, KINE 255, or KINE 260" to "HLTH/KINE 250, HLTH/KINE 255 or HLTH/KINE 260". Add HLTH 280 as crosslisted course.	Summer 2018
KINE 281	Change prerequisite from "KINE 250, KINE 255, or KINE 260. Recommended: FSN 210 and KINE 265." to "HLTH/KINE 250, HLTH/KINE 255 or HLTH/KINE 260. Recommended: FSN 210 and HLTH/KINE 265." Add HLTH 281 as crosslisted course.	Summer 2018
KINE 297	Add HLTH 297 as crosslisted course.	Spring 2018

KINE 298	Change requisite from "KINE 250 or KINE 255 or KINE 260. Recommended: STAT 217" to "one of the following: HLTH/KINE 250; HLTH/KINE 255; HLTH/KINE 260; or HLTH/KINE 265. Recommended: BIO 161; MCRO 221 or MCRO 224; and STAT 217 or STAT 218". Add HLTH 298 as crosslisted course.	Spring 2018
KINE 305	Change requisite from "BIO 231; KINE 250 or KINE 255 or KINE 260 or KINE 443" to "BIO 231; and one of the following: HLTH/KINE 250; HLTH/KINE 255; HLTH/KINE 260; or HLTH/KINE 443". Add HLTH 305 as crosslisted course.	Spring 2018
KINE 320/HLTH 320	Added prerequisite "Recommended: HLTH 299".	Summer 2018
KINE 320	Add HLTH 320 as crosslisted course.	Spring 2018
KINE 408	Change prerequisite from "KINE 330 or KINE 459; and one of the following: KINE 250, KINE 255, or KINE 260" to "KINE 230 and KINE 231 or KINE 330 or KINE 459; and one of the following: KINE 250, KINE 255, or KINE 260".	Winter 2018
KINE 434	Change prerequisite from "KINE 265 and KINE 298" to "HLTH/KINE 265; HLTH/KINE 298; and KINE 266 or HLTH 334. Add HLTH 434 as crosslisted course.	Spring 2018
KINE 435	Add HLTH 435 as crosslisted course.	Spring 2018
KINE 443	Add HLTH 443 as crosslisted course.	Spring 2018

KINE 449	Change prerequisite from "KINE 304; KINE 330 or KINE 459; and KINE 445" to "KINE 230 and KINE 231; or KINE 330; or KINE 459; and KINE 304 and KINE 445".	Winter 2018	Liberal Studies, BS	Added footnote to GE Area D1 "Recommended HIST 201 be taken to satisfy GE Area D1 for individuals planning to pursue a teaching credential."	8/15/18
KINE 450	Change prerequisite from "KINE 250 or KINE 255 or KINE 260; and KINE 266" to "one of the following: HLTH/ KINE 250; HLTH/ KINE 255; or HLTH/ KINE 260; and KINE 266 or HLTH 33". Add HLTH 4450 as crosslisted course.	Spring 2018	Manufacturing Engineering, BS	Curriculum substitution: In major coursework, add footnote to IME 481 & IME 482, "ENGR 463, ENGR 464 and ENGR 465 (6) may substitute for IME 481 and IME 482 (5) with the one excess unit counting towards Technical Electives".	12/8/17
KINE 453	Change requisite from "FSN 210 or KINE 451; and KINE 434" to "FSN 210 or KINE 451; and one of the following: HLTH/KINE 298; KINE 304; or FSN 310. Recommended: HLTH 405; and one of the following: KINE 266; HLTH 334; or FSN 415". Add HLTH 453 as crosslisted course.	Spring 2018	Manufacturing Engineering, BS	Curriculum substitution: In major coursework, add footnote to IME 481 & IME 482, "ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for IME 481 and IME 482 (5) with the one excess unit counting towards Technical Electives".	3/15/17
Kinesiology, BS	Correction: Change "Select one concentration" units from "18" to "18-19". Change free elective units from "9" to "8-9".	9/12/17	MATE 235	Remove requisite "Concurrent: MATE 222".	Summer 2017
Kinesiology Department	Kinesiology department changed name to "Kinesiology and Public Health".	Winter 2018	MATE 330	Remove requisite "Concurrent: MATE 370"	Summer 2017
LA 406	New course.	Summer 2018	MATE 340	Remove requisite "Concurrent: MATE 360".	Summer 2017
Liberal Studies, BS	Updated Program Learning Objectives.	12/20/17	MATE 360	Remove requisite "Concurrent: MATE 340".	Summer 2017
Liberal Studies, BS	Added general education designation (C2) to "PHIL 230 or PHIL 231" requirement.	6/20/17	MATE 370	Remove requisite "Concurrent: MATE 330".	Summer 2017
Liberal Studies, BS	Added footnote to GE Area C3 "Recommended courses to satisfy GE Area C3: MU 101, DANC 221, or TH 210 for individuals planning to pursue a teaching credential."	7/30/18	MATE 380	Remove "Junior standing" from prerequisite.	Summer 2017
			MATH 95	New course.	Fall 2018

MATH 112	Change prerequisite from "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level."	Fall 2018
MATH 115	New course.	Fall 2018
MATH 116	Change prerequisite from "Passing score on ELM examination, or an ELM exemption, or credit in MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or appropriate Math Placement Level."	Fall 2018
MATH 117	Change prerequisite from "MATH 116 with a grade of C- or better or consent of instructor" to "MATH 115 with a grade of C- or better; MATH 116 with a grade of C- or better; or consent of instructor."	Fall 2018
MATH 118	Change prerequisite from "Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination" to "Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination; or appropriate Math Level Placement."	Fall 2018

MATH 119	Change prerequisite from "Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 117, or MATH 118" to "Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 117; or MATH 118."	Fall 2018
MATH 141	Change prerequisite from "Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 118 and high school trigonometry, or MATH 119" to "Completion of ELM requirement and passing score on Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 118 and high school trigonometry; or MATH 119."	Fall 2018
MATH 161	Change prerequisite from "Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 118" to "Completion of ELM requirement and passing score on Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 118."	Fall 2018

MATH 221	Change prerequisite from "Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination, or MATH 118" to "Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 118."	Fall 2018	Mechanical Engineering, BS	Curriculum substitution: In Mechatronics concentration required coursework, change requirement from "ME 423" to "ME 423 or ME 506 or ME 507".	7/21/17
MATH 227	Change prerequisite from "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level."	Fall 2018	Mechanical Engineering, BS	Curriculum substitution: In General, Mechatronics and Manufacturing concentrations, add footnote to ME 428, ME 429, ME 430; "ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for ME 428, ME 429 and ME 430 (6).	5/15/17
Materials Engineering, BS	Curriculum substitution: In major coursework, add footnote to MATE 482, MATE 483 & MATE 484, "ENGR 459, ENGR 460 and ENGR 461 (6) may substitute for MATE 482, MATE 483 & MATE 484 (5) with the one excess unit counting towards Technical Electives".	3/17/17	Media Arts, Society, and Technology Minor	Add Request for Approved Electives: Added topic "Pop Culture" to ISLA 320.	4/10/18
ME 409	New course.	Spring 2018	Minimum Requirements for Graduation	Update Academic Residence Requirements from "30 units in residence of the last 40 units counted toward the degree" to "28 units in residence of the last 40 units counted toward the degree" per approved Academic Senate Resolution (AS-827-17).	4/18/17
ME 437	New course.	Fall 2018	MSCI-Marine Sciences, B.S.	Change requirement from "CHEM 216" to "CHEM 2016 or CHEM 312".	06/06/18
ME 438	New course.	Fall 2018	MU 161	Change prerequisite from "Music major and consent of instructor" to "Music major or consent of instructor".	Spring 2018
ME 439	New course.	Winter 2019	MU 265	Change prerequisite from "Music major and consent of instructor" to "Consent of instructor".	Spring 2018
Mechanical Engineering, BS	Add Request for Approved Electives: In General Concentration, added topic courses for ME 470 and ME 471 to footnote #2.	7/21/17	Music Minor	Added upper-division approved electives performance courses to comment #4.	11/8/17
			NR 400	Correction: Change total credit limit from "4 units" to "12 units".	5/16/17

Nutrition, BS	Curriculum substitution: In major coursework, add footnote to FSN 461, "Credit in FSN 470 with the topic "Senior Project: Nutrition for Sport and Exercise" (2 units) and credit in FSN 470 with the topic "Senior Project: Writing" (1 unit) may substitute for FSN 461".	5/30/17	PHYS 104	Change prerequisite from "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level."	Fall 2018
Nutrition, BS	Curriculum substitution: In Nutrition and Food Industries concentration required coursework, change requirement from "FSN 410" to "FSN 341 or FSN 410". Added footnote "FSN 341 may not be double-counted as an approved elective".	5/17/17	PHYS 107	Change prerequisite from "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level."	Fall 2018
Nutrition, BS	Curriculum substitution: In major coursework, change requirement from "FSN 230" to "FSN 230 or FSN 319". Added footnote "Requirement may be fulfilled if a student takes a GE course to fulfill a major requirement. If so, the student will need additional units of free electives to complete the total units required for the degree."		Physics, BA	Add footnote: "Excess units will count towards Breadth Elective units."	5/21/18
			Physics, BA	Add footnote: "Units in excess of 1 unit will count towards Technical Elective units."	5/21/08
			Physics, BS	Add footnote: "Excess units will count towards Breadth Elective units."	5/21/18
			Physics, BS	Add footnote: "Units in excess of 3 units will count towards Physics Elective units."	5/21/18
Packaging Value Chain, MS	New graduate degree program.	Fall 2017	Political Science, BA	Add Request for Approved Electives: Added POLS 440.	3/16/18
PHIL 439	Changed course to be repeatable. Added "Total credit limited to 12 units" to course description.	Winter 2019	POLS 111	Add "Course may be offered in classroom-based or hybrid format" to course description.	Winter 2018
			POLS 338	Add HNRS 338 as crosslisted course.	Winter 2018
			POLS 440	New course.	Summer 2018
			POLS 518	Change prerequisite from "POLS 560" to "Graduate standing or consent of instructor".	Summer 2018
			POLS 550	Change prerequisite from "POLS 515" to "Graduate standing or consent of instructor".	Summer 2018

Professional Certificates	Update to indicate Graduate Education is no longer using Interfolio for applications and there are no longer state residency limitations on participation in online courses for certificates.	6/15/18
Psychology Minor	Add Request for Approved Electives: Added BUS 387.	7/31/17
Public Health, BS	New undergraduate degree program.	Fall 2018
Quantitative Economics, MS	Changed program name from "MS Economics" to "MS Quantitative Economics".	Fall 2017
Real Property Development Minor	Curriculum substitution: In required coursework, change requirement from "CRP 446" to "CRP 446 or CRP 442 or CRP 412".	9/21/17
Real Property Development Minor	Update footnote #1 from, "If CM 232 is taken for 3 units, then 4 units of approved electives must be at the 300-400 level" to "If CM 232 is taken, then at least 4 units of approved electives at the 300-400 level must be completed to meet the minimum requirement of 12 units of upper-division coursework for the minor".	5/8/17
Recreation, Parks, and Tourism Administration, BS	Add footnote, "Some GE requirements may be met by course selections within the Support electives and/or concentration; in that case, additional free electives may be required to reach a total of 180 units" to Concentration and Support Electives.	4/24/17

RPTA 210 Change prerequisite from "major or minor in Recreation, Parks, and Tourism Administration, or in Experience Industry Management; and sophomore standing" to "Recreation, Parks, and Tourism Administration major; and sophomore standing". Spring 2018

SCM 230 Reactivate course in the catalog. Summer 2017

SCM 360 Change prerequisite from "Junior standing and completion of GE Area B and one of the following: CHEM 110, CHEM 111, CHEM 123, CHEM 127" to "Completion of GE Area B; and junior standing". Spring 2018

SOC 110 Added "Course may be offered in classroom-based or online format" to course description. Summer 2018

SOC 326 Added "Course may be offered in classroom-based or online format" to course description. Summer 2018

SOC 431 Change course title from "Population, Migration and the Environment" to "World Population Processes and Problems". Change course description. Change prerequisites from "SOC 111 or consent of instructor" to "SOC 110 or ANT 201". Added "Recommended: SOC 354; SOC 355; or ANT/GEOG 455." Summer 2018

Special Education, MS New graduate degree program. Fall 2018

SS 121	Update prerequisite from "College chemistry and passing score on ELM examination, or an ELM exemption, or credit in MATH 104" to "College chemistry and passing score on ELM examination, or an ELM exemption, or credit in MATH 96 (formerly MATH 104)".	5/16/17
SS 121	Change prerequisite from "College chemistry and passing score on ELM examination, or an ELM exemption, or credit in MATH 96 (formerly MATH 104)" to "College chemistry; and passing score on ELM examination or an ELM exemption or MATH 96 (formerly MATH 104) or MATH 115 or appropriate Math Placement Level."	Fall 2018
SS 402	Reactivate course in the catalog.	Spring 2018
STAT 130	Change prerequisite from "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level."	Fall 2018
STAT 217	Change prerequisite from "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level."	Fall 2018

STAT 218	Change prerequisite from "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104)" to "Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level."	Fall 2018
STAT 251	Change prerequisite from "Completion of the ELM requirement and a passing score on appropriate Mathematics Placement Examination for MATH 221 eligibility, or MATH 118 or equivalent" to "Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 118."	Fall 2018
STAT 252	Added "Course may be offered in classroom-based or online format" to course description.	Summer 2018

STAT 313	Change prerequisite from "STAT 217 or STAT 218 or STAT 312 or STAT 542; and MATH 118 or equivalent, or completion of the ELM requirement and a passing score on the appropriate Mathematics Placement Examination for MATH 221 eligibility" to "STAT 217, STAT 218, STAT 312, or STAT 542; and MATH 118, or completion of the ELM requirement and passing score on the appropriate Mathematics Placement Examination, or appropriate Math Placement Level."	Fall 2018
Studio Art Minor	Curriculum substitution: In ART approved electives, change requirement from "ART 448" to "ART 448 or ART 353".	3/22/18
Technical Communication Certificate	Retract the change to "Technical and Professional Communication" certificate back to "Technical Communication".	11/6/17
Water Science Minor	Add Request for Approved Electives: added ERSC 303.	06/12/18
WGS 201	Add HNRS 204 as crosslisted course.	Summer 2018
WGS 350	Add HNRS 353 as crosslisted course.	Summer 2018
WLC 310	Offer the topic "Cultures of Germany" online.	Summer 2018
WLC 370	Added "Course may be offered in classroom-based or online format" to course description.	Summer 2018

COLLEGES AND DEPARTMENTS

College of Agriculture, Food and Environmental Sciences (p. 63)

- Agribusiness (p. 75)
- Agricultural Education and Communication (p. 77)
- Animal Science (p. 84)
- BioResource and Agricultural Engineering (p. 95)
- Experience Industry Management (p. 101)
- Food Science and Nutrition (p. 108)
- Horticulture and Crop Science (p. 118)
- Military Science (p. 124)
- Natural Resources Management and Environmental Sciences (p. 127)
- Wine and Viticulture (p. 145)

College of Architecture and Environmental Design (p. 150)

- Architectural Engineering (p. 153)
- Architecture (p. 157)
- City and Regional Planning (p. 161)
- Construction Management (p. 166)
- Landscape Architecture (p. 169)

Orfalea College of Business (p. 172)

College of Engineering (p. 191)

- Aerospace Engineering (p. 198)
- Biomedical Engineering (p. 203)
- Civil and Environmental Engineering (p. 209)
- Computer Engineering (p. 216)
- Computer Science and Software Engineering (p. 219)
- Electrical Engineering (p. 231)
- General Engineering (p. 237)
- Industrial and Manufacturing Engineering (p. 240)
- Materials Engineering (p. 247)
- Mechanical Engineering (p. 251)

College of Liberal Arts (p. 257)

- Art and Design (p. 260)
- Communication Studies (p. 265)
- English (p. 268)
- Ethnic Studies (p. 273)
- Graphic Communication (p. 277)
- History (p. 281)
- Interdisciplinary Studies in the Liberal Arts (p. 285)
- Journalism (p. 294)
- Music (p. 297)
- Philosophy (p. 301)
- Political Science (p. 304)
- Psychology and Child Development (p. 309)
- Social Sciences (p. 316)
- Theatre and Dance (p. 324)

- Women's and Gender Studies (p. 328)
- World Languages and Cultures (p. 331)

College of Science and Mathematics (p. 336)

- Biological Sciences (p. 340)
- Chemistry and Biochemistry (p. 356)
- Kinesiology and Public Health (p. 362)
- Liberal Studies (p. 371)
- Mathematics (p. 376)
- Physics (p. 382)
- Statistics (p. 395)
- School of Education (p. 386)

Interdisciplinary Programs (p. 398)

- BA Liberal Arts and Engineering Studies (<http://catalog.calpoly.edu/collegesandprograms/interdisciplinaryprograms/baliberalartsandengineeringstudies>)
- MS Engineering Management (p. 404)
- MCRP/MS Engineering, Transportation Planning (p. 406)

COURSES A-Z

College of Agriculture, Food and Environmental Science (AG) (p. 524)

- Agribusiness (AGB) (p. 509)
- Agricultural Education and Communication (AGC (p. 513), AGED (p. 514))
- Animal Science (ASCI (p. 526), DSCI (p. 623))
- BioResource and Agricultural Engineering (BRAE (p. 550))
- Experience Industry Management (RPTA (<http://catalog.calpoly.edu/coursesaz/rpta>))
- Food Science and Nutrition (FSN (p. 672))
- Horticulture and Crop Science (AEPS (p. 518))
- Military Science (MSL (p. 767))
- Natural Resources Management and Environmental Sciences (ERSC (p. 629), NR (p. 776), SS (p. 813))
- Wine and Viticulture (WVIT (p. 826))

College of Architecture and Environmental Design (EDES (p. 664))

- Architectural Engineering (ARCE (p. 535))
- Architecture (ARCH (p. 540))
- City and Regional Planning (CRP (p. 587))
- Construction Management (CM (p. 619))
- Landscape Architecture (LA (p. 738))

Orfalea College of Business (BUS (p. 569), ECON (p. 632), GSA (p. 684), GSB (p. 685), GSE (p. 689), GSP (p. 695), ITP (p. 713))

College of Engineering (ENGR (p. 650), FPE (p. 671))

- Aerospace Engineering (AERO (p. 501))
- Biomedical Engineering (BMED (p. 563))
- Civil and Environmental Engineering (CE (p. 593), ENVE (p. 664))
- Computer Engineering (CPE (p. 605))
- Computer Science (CSC (p. 610))
- Electrical Engineering (EE (p. 642))
- General Engineering (ENGR (p. 650))
- Industrial and Manufacturing Engineering (IME (p. 717), SIE (p. 822))
- Materials Engineering (MATE (p. 746))
- Mechanical Engineering (ME (p. 759))

College of Liberal Arts

- Art and Design (ART (p. 544))
- Communication Studies (COMS (p. 601))
- English (ENGL (p. 654), ESE (p. 629))
- Ethnic Studies (ES (p. 667))
- Graphic Communication (GRC (p. 690))
- History (HIST (p. 696))
- Humanities (ISLA (p. 723))
- Journalism (JOUR (p. 725))
- Music (MU (p. 769))
- Philosophy (PHIL (p. 781), RELS (p. 806))
- Political Science (POLS (p. 793))
- Psychology and Child Development (CD (p. 584), PSY (p. 799))

- Social Sciences (ANT (p. 532), GEOG (p. 679), SOC (p. 810), SOCS (p. 809))
- Theatre and Dance (DANC (p. 627), TH (p. 822))
- Women's and Gender Studies (WGS (p. 829))
- World Languages and Cultures (CHIN (p. 586), FR (p. 678), GER (p. 682), ITAL (p. 725), JPNS (p. 725), SPAN (p. 815), WLC (p. 831))

College of Science and Mathematics (SCM (p. 808))

- Biological Sciences (BIO (p. 556), BOT (p. 568), MCRO (p. 766), MSC1 (p. 745))
- Chemistry and Biochemistry (CHEM (p. 577))
- Kinesiology (KINE (p. 729))
- Liberal Studies (LS (p. 743))
- Mathematics (ESM (p. 629), MATH (p. 750))
- Physics (ASTR (p. 549), GEOL (p. 681), PHYS (p. 788), PSC (p. 787))
- School of Education (EDUC (p. 635))
- Statistics (DATA (p. 629), STAT (p. 818))

Extended Education (GS (p. 683))

Interdisciplinary or University-Wide

- Honors Program (HNRC (p. 712), HNRS (p. 704))
- Intercollegiate Athletics (PEM (p. 786), PEW (p. 787))
- Liberal Arts and Engineering Studies Program (LAES (p. 742))
- University Studies (UNIV (p. 825))

A

Aerospace Engineering (AERO) (p. 501)

Agribusiness (AGB) (p. 509)

Agricultural and Environmental Plant Sciences (AEPS) (p. 518)

Agricultural Communication (AGC) (p. 513)

Agricultural Education (AGED) (p. 514)

Agriculture (AG) (p. 524)

Animal Science (ASCI) (p. 526)

Anthropology (ANT) (p. 532)

Architectural Engineering (ARCE) (p. 535)

Architecture (ARCH) (p. 540)

Art (ART) (p. 544)

Astronomy and Astrophysics (ASTR) (p. 549)

B

Biology (BIO) (p. 556)

Biomedical Engineering (BMED) (p. 563)

BioResource and Agricultural Engineering (BRAE) (p. 550)

Botany (BOT) (p. 568)

Business (BUS) (p. 569)

C

Chemistry (CHEM) (p. 577)

Child Development (CD) (p. 584)

Chinese (CHIN) (p. 586)

City and Regional Planning (CRP) (p. 587)

Civil Engineering (CE) (p. 593)

Communication Studies (COMS) (p. 601)

Computer Engineering (CPE) (p. 605)

Computer Science (CSC) (p. 610)

Construction Management (CM) (p. 619)

D

Dairy Science (DSCI) (p. 623)

Dance (DANC) (p. 627)

Data Science (DATA) (p. 629)

E

Early Start English (ESE) (p. 629)

Early Start Math (ESM) (p. 629)

Earth Science (ERSC) (p. 629)

Economics (ECON) (p. 632)

Education (EDUC) (p. 635)

Electrical Engineering (EE) (p. 642)

Engineering (ENGR) (p. 650)

English (ENGL) (p. 654)

Environmental Design (EDES) (p. 664)

Environmental Engineering (ENVE) (p. 664)

Ethnic Studies (ES) (p. 667)

F

Fire Protection Engineering (FPE) (p. 671)

Food Science and Nutrition (FSN) (p. 672)

French (FR) (p. 678)

G

Geography (GEOG) (p. 679)

Geology (GEOL) (p. 681)

German (GER) (p. 682)

Graduate Studies (GS) (p. 683)

Graduate Studies-Accounting (GSA) (p. 684)

Graduate Studies-Business (GSB) (p. 685)

Graduate Studies-Economics (GSE) (p. 689)

Graduate Studies-Packaging (GSP) (p. 695)

Graphic Communication (GRC) (p. 690)

H

Health (HLTH) (<http://catalog.calpoly.edu/coursesaz/hlth>)

History (HIST) (p. 696)

Honors Contract (HNRC) (p. 712)

Honors (HNRS) (p. 704)

I

Industrial and Manufacturing Engineering (IME) (p. 717)

Industrial Technology and Packaging (ITP) (p. 713)

Interdisciplinary Studies in Liberal Arts (ISLA) (p. 723)

Italian (ITAL) (p. 725)

J

Japanese (JPNS) (p. 725)

Journalism (JOUR) (p. 725)

K

Kinesiology (KINE) (p. 729)

L

Landscape Architecture (LA) (p. 738)

Liberal Arts and Engineering Studies (LAES) (p. 742)

Liberal Studies (LS) (p. 743)

M

Marine Science (MSCI) (p. 745)

Materials Engineering (MATE) (p. 746)

Mathematics (MATH) (p. 750)

Mechanical Engineering (ME) (p. 759)

Microbiology (MCRO) (p. 766)

Military Science Leadership (MSL) (p. 767)

Music (MU) (p. 769)

N

Natural Resources (NR) (p. 776)

P

Philosophy (PHIL) (p. 781)

Physical Education: Men (PEM) (p. 786)

Physical Education: Women (PEW) (p. 787)

Physical Science (PSC) (p. 787)

Physics (PHYS) (p. 788)

Political Science (POLS) (p. 793)

Psychology (PSY) (p. 799)

R

Recreation, Parks and Tourism Administration (RPTA) (<http://catalog.calpoly.edu/coursesaz/rpta>)

Religious Studies (RELS) (p. 806)

S

Science and Mathematics (SCM) (p. 808)

Social Sciences (SOCS) (p. 809)

Sociology (SOC) (p. 810)

Soil Science (SS) (p. 813)

Spanish (SPAN) (p. 815)

Statistics (STAT) (p. 818)

Systems Integration Engineering (SIE) (p. 822)

T

Theatre (TH) (p. 822)

U

University Studies (UNIV) (p. 825)

W

Wine and Viticulture (WVIT) (p. 826)

Women's and Gender Studies (WGS) (p. 829)

World Languages and Cultures (WLC) (p. 831)

Aerospace Engineering (AERO)

AERO Courses

AERO 121. Aerospace Fundamentals. 2 units

Term Typically Offered: F

Introduction to the engineering profession including the aeronautical and aerospace fields. Engineering approach to problem-solving and analysis of data obtained from experiments. Basic nomenclature and design criteria used in the aerospace industry. Applications to basic problems in the field. 1 lecture, 1 laboratory.

AERO 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units.

AERO 215. Introduction to Aerospace Design. 2 units

Term Typically Offered: F, W

Prerequisite: AERO 121, MATH 143, and IME 144. Recommended: CSC 111.

Introduction to problem solving techniques and team-centered design projects in aerospace engineering. Primary emphasis on the solutions of design problems in aerospace engineering using computers. 2 laboratories.

AERO 220. Aerospace Systems Engineering and Integration. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: AERO 121.

Project-based study of fundamental systems engineering concepts including sub-system interface requirements, verification and validation, modeling/analysis/design, and implementation of complex aerospace systems. 1 laboratory.

AERO 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

AERO 299. Aerospace Thermodynamics. 4 units

Term Typically Offered: SP

Prerequisite: ME 212. Corequisite: AERO 300. Recommended: AERO 215.

Basics of thermodynamics, energy, systems and control volume analysis. First law, second law, phase change and energy analysis for aerospace-relevant applications. Entropy and exergy, cycle analysis (Rankine, Brayton, turbojets and turbofans). Not open to students with credit in AERO 301. 3 lectures, 1 laboratory.

AERO 300. Aerospace Engineering Analysis. 5 units

Term Typically Offered: SP

Prerequisite: AERO 215, MATH 244, ME 211, and PHYS 133.

Analytical methods for aerospace engineering problems. Topics include vector calculus, linear algebra, differential equations, Laplace transforms and Fourier series. Computer tools and numerical methods as applied to problems in aerodynamics, structures, stability and control and astronautics. 4 lectures, 1 laboratory.

AERO 302. Aerospace Fluid Mechanics. 4 units

Term Typically Offered: F

Prerequisite: ME 212. Corequisite: AERO 300. Recommended: AERO 215; and AERO 299 or AERO 301.

Properties of fluids, statics, mass/energy/momentum for aeronautical applications, external aerodynamics (lift and drag), dimensional analysis for scale testing, introduction to differential analysis and Navier-Stokes equations, basics of laminar and turbulent boundary layers. 3 lectures, 1 laboratory.

AERO 303. Aerospace Gas Dynamics and Heat Transfer. 4 units

Term Typically Offered: W

Prerequisite: AERO 299 or AERO 301; and AERO 302.

Basics of heat transfer and approaches to problem solving, steady heat conduction, convection (forced and natural), heat exchanger design, shock waves and compressible flow in nozzles and diffusers (normal, oblique, expansion waves), thermal radiation and applications. 3 lectures, 1 laboratory.

AERO 304. Experimental Aerothermodynamics. 2 units

Term Typically Offered: W

Prerequisite: AERO 299 or AERO 301; ENGL 149.

Laboratory experiments verify the momentum and energy equations. Mass flow rate, fan performance, boundary layer measurements, diffuser performance, and induction pump performance experiments are evaluated. Introduction to electronic sensors, signals and data acquisition. 1 lecture, 1 laboratory.

AERO 306. Aerodynamics and Flight Performance. 4 units

Term Typically Offered: F

Prerequisite: AERO 215; AERO 299 or AERO 301. Concurrent: AERO 302.

Introduction to theoretical aerodynamics. Primary emphasis in the subsonic region, including compressibility effects. Basic aerodynamic theory: Airfoil theory, wing theory, lift and drag. Team-centered aerodynamic design. Flight performance. 4 lectures.

AERO 307. Experimental Aerodynamics. 2 units

Term Typically Offered: SP

Prerequisite: AERO 302, AERO 306, ENGL 149.

Wind tunnel testing of basic aerodynamic properties of airfoils, finite wings, aircraft or spacecraft models, and vehicle flight performance. Emphasis on both static and dynamic responses of aircraft. Various measurement techniques, data reduction schemes, and analysis methods. 2 laboratories.

AERO 310. Air and Space. 4 units

GE Area F

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing and Completion of GE Area B.

Technological innovations that have led to modern aircraft and spacecraft as viewed from an historical perspective. Development of aerodynamics, propulsion systems, light-weight structures, and control systems. How aviation has affected, and been affected by, history. Impact of aviation on society, including civil and military aircraft/spacecraft. Federal regulation of aviation, including air traffic control and airlines. Future developments in air and space technology. 4 lectures. Crosslisted as AERO/HNRS 310. Fulfills GE Area F.

AERO 311. Aircraft Development History. 4 units

Term Typically Offered: F

Prerequisite: AERO 215. Recommended: Sophomore standing.

Traces the engineering evolution of commercial and military aircraft from the Wright Flyer to modern designs. Studies include how aircraft design is driven by the combination of requirements, deterrents and advancing technologies resulting in the continuous innovation of configurations. 4 lectures.

AERO 320. Fundamentals of Dynamics and Control. 4 units

Term Typically Offered: F

Prerequisite: AERO 300 and ME 212. Corequisite: AERO 321.

Introduction to six degree of freedom rigid body dynamic and kinematic equations of motion, including coordinate transformations, Euler angles and quaternions for aerospace vehicles. Linearization and dynamic system theory and stability. Introduction to linear control theory, controller design and analysis. 4 lectures.

AERO 321. Experimental Sensors, Actuators and Control. 1 unit

Term Typically Offered: F

Corequisite: AERO 320.

Experiments in translational and rotational dynamics, structural, thermal, and flow control. Comparison of modeling/simulation results to experimental data. Role of actuators, sensors, noise, feedback, and supporting instrumentation hardware and software. Introduction to technical communication. 1 laboratory.

AERO 331. Aerospace Structural Analysis I. 4 units

Term Typically Offered: W

Prerequisite: AERO 300, CE 207, and ME 212.

Deflection analysis. Principles of fictitious displacement, virtual work, and unit load method. Energy methods: Castigliano's theorem, Maxwell-Betti reciprocal theorem, minimum principles, Rayleigh-Ritz's method and Galerkin's method. Stress analysis of aircraft and spacecraft components. 4 lectures.

AERO 351. Introduction to Orbital Mechanics. 4 units

Term Typically Offered: F

Prerequisite: AERO 300 and ME 212.

Motion of a body in a central field. Keplerian Orbits. Orbital maneuvers. Interplanetary trajectories. 4 lectures.

AERO 353. Spacecraft Environment. 4 units

Term Typically Offered: W

Prerequisite: AERO 299 or AERO 301; AERO 300.

Effects of the space environment on a spacecraft and design considerations. Topics include the launch, vacuum, particulate, plasma, and radiation environments 4 lectures.

AERO 354. Space Environment Laboratory. 2 units

Term Typically Offered: SP

Prerequisite: ENGL 149 and AERO 353.

Laboratory examples of the effects of the space environment on a spacecraft and design considerations. Topics include the launch, vacuum, particulate, plasma, and radiation environments. All topics are applied to how the environment affects spacecraft design considerations. 2 laboratories.

AERO 360. Creative Problem Solving in Engineering Design. 2 units

Term Typically Offered: W

Prerequisite: PSY 350.

The creative problem solving process for an engineering design team. How to explore context and causes as part of defining a design problem; the principles of brainstorming, synthesis, and judgment. Role of iteration, implementation, and communication. Importance of a diverse view, including: customers, products, processes, systems, ethics, and professional responsibility. Team-based applications to case studies and real-world engineering design problems. 2 laboratories.

AERO 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units.

AERO 401. Propulsion Systems. 5 units

Term Typically Offered: F

Prerequisite: AERO 303, CHEM 124.

Power plant types, components, characteristics, and requirements. Principles of thrust and energy utilization. Thermodynamic processes and performance of turboprop, turboshaft, turbofan, turbojet, ramjet, and rocket engines. 4 lectures, 1 laboratory.

AERO 402. Spacecraft Propulsion Systems. 5 units

Term Typically Offered: F

Prerequisite: AERO 303, AERO 353 and CHEM 124.

Effects of the propulsion subsystem on spacecraft design. Introduction to air breathing propulsion systems. Topics include basic rocket performance, monopropellant thrusters, bipropellant thrusters, electric thrusters, thruster placement, plumbing, tank sizing and design, system layout, component design, and systems integration. 4 lectures, 1 laboratory.

AERO 405. Supersonic and Hypersonic Aerodynamics. 4 units

Term Typically Offered: SP

Prerequisite: AERO 303; and AERO 306 or AERO 353.

Review of gas dynamics, shock-wave and boundary-layer interaction, aerodynamic design. 2-dimensional supersonic flows around thin airfoil; finite wing in supersonic flow. Local surface inclination methods for high-speed flight, boundary-layer and aerodynamic heating, viscous interactions. 4 lectures.

AERO 406. Applied Computational Fluid Dynamics. 4 units

Term Typically Offered: F

Prerequisite: AERO 302 and AERO 306.

Application of Computational Fluid Dynamics to study a range of problems relating to applications in aerospace and automotive engineering. Grid generation, sources of errors in CFD studies, boundary conditions, 2D and 3D external flows, and turbulence modeling. 2 lectures, 2 laboratories.

AERO 407. Reentry Aerodynamics. 4 units

Term Typically Offered: W

Prerequisite: AERO 303.

Near planet environments. Transition from orbital to aero-dynamic motion. Aerodynamic heating and effects on design. 4 lectures.

AERO 409. Flight Test. 4 units

Term Typically Offered: W

Prerequisite: AERO 306. Concurrent: AERO 320.

Overview of flight tests, test equations, and supporting facilities. Principles of team-centered flight testing with applications to performance, stability and control, and avionics systems testing. Test planning, instrumentation, data analysis and reports. 2 lectures, 2 laboratories.

AERO 420. Aircraft Dynamics and Control. 4 units

Term Typically Offered: W

Prerequisite: AERO 306 and AERO 320.

Newton's 6-degree-of-freedom equations of motion applied to aerospace vehicles. Stability and control derivatives, reference frames, steady-state and perturbed dynamic analyses applied to aerospace vehicles. Stability and control design principles applied to transfer functions, state-space, and modal system dynamics. 4 lectures.

AERO 421. Spacecraft Attitude Dynamics and Control. 4 units

Term Typically Offered: SP

Prerequisite: AERO 320 and AERO 351.

Introduction to spacecraft attitude dynamics and control. Momentum exchange devices and bang-bang thruster control. Orbit determination (GPS), maneuvers and station keeping. Fundamentals of guidance and navigation systems. Analysis and design of control systems for aerospace vehicles. 4 lectures.

AERO 425. Aircraft Performance. 4 units

Term Typically Offered: F

Prerequisite: ME 212, AERO 306, AERO 300.

Fundamentals of propeller and jet aircraft performance. Steady and accelerated flight. Equations of motion. Level flight, gliding, climbing, driftdown. Takeoff and landing. Federal Aviation Regulations (FARs). Range and endurance. Payload-range diagram. Maneuvering. V-n diagram. Turning and pull-ups. Stall and spin behavior. Energy methods. 4 lectures.

AERO 431. Aerospace Structural Analysis II. 4 units

Term Typically Offered: SP

Prerequisite: AERO 331.

Basic equations of elasticity with applications to typical aerospace structures. Concepts studied include analysis of aircraft and aerospace structures; airworthiness and airframe loads; structural constraints; elementary aeroelasticity; structural instability; introduction to modern fatigue; fracture mechanics; and composite structures analysis. 4 lectures.

AERO 432. Advanced Composite Structures Analysis. 4 units

Term Typically Offered: F

Prerequisite: AERO 331.

Review of isotropic material behavior. Behavior of unidirectional fiber composites. Properties of short-fiber composites and orthotropic lamina. Analysis of laminated composites. Stresses and strains of composites. Strength and hygrothermal behavior of composite materials. 3 lectures, 1 laboratory.

AERO 433. Experimental Stress Analysis. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: AERO 331, AERO 431.

Employing the knowledge of stress analysis and aerospace structural analysis in an individual and group design project dealing with aerospace structures. 1 laboratory.

AERO 434. Aerospace Structural Analysis III. 4 units

Term Typically Offered: F

Prerequisite: AERO 431.

Analysis and design applications for aircraft and spacecraft structures. Stress concentrations, fatigue, and fracture mechanics. Structural dynamics. Framed structures, plates and shells. Composite applications. 4 lectures.

AERO 435. Aerospace Numerical Analysis. 4 units

Term Typically Offered: F

Prerequisite: AERO 300, AERO 331.

Taylor series. Finite difference calculus. Interpolation and extrapolation. Finite difference method. Basic equations of elasticity. Global stiffness matrix. Rayleigh-Ritz method. Galerkin method. Bernoulli-Euler beam element. Finite element formulation. Dynamic analysis. 3 lectures, 1 laboratory.

AERO 443. Aircraft Design I. 4 units

Term Typically Offered: F

Prerequisite: Senior standing, IME 144, AERO 215, AERO 303, AERO 306, AERO 331, AERO 405, AERO 420, AERO 431. Concurrent: AERO 401.

Preliminary layout of a typical aircraft vehicle using design and calculation techniques developed in previous aerospace engineering courses. Design of a flight vehicle, including its structures and systems. Preparation of necessary drawings and a report. 2 lectures, 2 laboratories. Open to students enrolled in the multidisciplinary design minor.

AERO 444. Aircraft Design II. 3 units

Term Typically Offered: W

Prerequisite: AERO 443 and senior standing.

Preliminary layout of a typical aircraft vehicle using design and calculation techniques developed in previous aerospace engineering courses. Design of a flight vehicle, including its structures and systems. Preparation of necessary drawings and a report. 3 laboratories.

AERO 445. Aircraft Design III. 3 units

Term Typically Offered: SP

Prerequisite: AERO 444 and senior standing.

Preliminary layout of a typical aircraft vehicle using design and calculation techniques developed in previous aerospace engineering courses. Design of a flight vehicle, including its structures and systems. Preparation of necessary drawings and a report. 3 laboratories.

AERO 446. Introduction to Space Systems. 4 units

Term Typically Offered: SP

Prerequisite: ME 212; EE 201 and EE 251; and AERO 353.

Basic satellite types and their applications. Major subsystems of a satellite system including ground support and launch systems. Interactions between subsystems and their effects on the overall system design. Detailed analysis of key subsystems on a spacecraft with special emphasis on power and communications subsystems. 4 lectures.

AERO 447. Spacecraft Design I. 4 units

Term Typically Offered: F

Prerequisite: IME 144; AERO 215; AERO 303; AERO 331; AERO 351; AERO 420 or AERO 421; AERO 431; AERO 446; and senior standing. Concurrent: AERO 402. Recommended: AERO 353.

Preliminary layout of typical space vehicle using design and calculation techniques developed in previous aerospace engineering courses. Design of selected components and preparation of necessary drawings. 2 lectures, 2 laboratories. Open to students enrolled in the multidisciplinary design minor.

AERO 448. Spacecraft Design II. 3 units

Term Typically Offered: W

Prerequisite: AERO 447.

Preliminary layout of typical space vehicle using design and calculation techniques developed in previous aerospace engineering courses. Design of selected components and preparation of necessary drawings. 3 laboratories. Open to students enrolled in the multidisciplinary design minor.

AERO 449. Spacecraft Design III. 3 units

Term Typically Offered: SP

Prerequisite: AERO 448.

Preliminary layout of typical space vehicle using design and calculation techniques developed in previous aerospace engineering courses. Design of selected components and preparation of necessary drawings. 3 laboratories. Open to students enrolled in the multidisciplinary design minor.

AERO 450. Introduction to Aerospace Systems Engineering. 4 units

Term Typically Offered: W

Prerequisite: Senior standing or graduate standing.

Aerospace systems and subsystems. Systems integration. Development of system requirements. Analysis, modeling and simulation of complex systems. Project management. Cost analysis. Optimization and trade studies. 4 lectures.

AERO 452. Spaceflight Dynamics II. 4 units

Term Typically Offered: F

Prerequisite: AERO 351.

Relative orbital motion and rendezvous, linearization of the equations of motion. Clohessy-Wiltshire equations. Two-impulse rendezvous. Asphericity of the earth, aerodynamic drag, solar radiation pressure, and n-body perturbations on an orbit. Encke, Cowell, and Variation of Parameters solution techniques. Speciality orbit due to perturbations such as low thrust trajectories, sun-synchronous, and molynia orbits. 4 lectures.

AERO 460. Aerospace Engineering Professional Preparation. 1 unit

Term Typically Offered: F

Prerequisite: Senior standing.

Topics on professional development for student success including resume building and career prospecting, current events in the aerospace industry, graduate studies, engineering ethics, intellectual property, non-disclosure agreements, teamwork, and innovation and entrepreneurship. 1 activity.

AERO 463. Senior Project Laboratory I. 2 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Selection and completion of a project by individuals or team which is typical of problems which graduates must solve in their fields of employment. Project involves, but is not limited to, physical modeling and testing of integrated design and may include students from other disciplines. Formulation of outline, literature review, and project schedule. 2 laboratories. Note: although AERO 463, 464 substitute for AERO 461, 462, students may not use repeat credit for the purpose of increasing GPA.

AERO 464. Senior Project Laboratory II. 3 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Selection and completion of a project by individuals or team which is typical of problems which graduates must solve in their fields of employment. Project involves, but is not limited to, physical modeling and testing of integrated design and may include students from other disciplines. Formulation of outline, literature review, and project schedule. 3 laboratories. Note: although AERO 463, 464 substitute for AERO 461, 462, students may not use repeat credit for the purpose of increasing GPA.

AERO 465. Aerospace Systems Senior Laboratory. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: AERO 303, AERO 320, AERO 431 and senior standing.

Culminating laboratory based experience. Experiments require the integration of the many disciplines in Aerospace Engineering. The successful completion of each experiment requires synthesis and integration of the fundamental concepts of the engineering sciences. Experimentation in the areas of aeroelasticity, active vibration control, inertial navigation, thermal control, hardware-in-the-loop simulation, and momentum exchange. 1 laboratory.

AERO 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

AERO 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

AERO 493. Cooperative Education Experience. 2 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units.

AERO 494. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units.

AERO 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

AERO 500. Individual Study. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Total credit limited to 12 units.

AERO 510. Systems Engineering I. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing or consent of instructor.

Project management. Scheduling and budgeting. Queuing theory. Process control and life-cycle cost analysis. Contracts and negotiation. 4 lectures. Crosslisted as AERO/IME 510.

AERO 511. Systems Engineering II. 4 units

Term Typically Offered: SP

Prerequisite: AERO 510 or IME 510, graduate standing or consent of instructor.

Risk management. Design strategies to meet system/mission requirements. Design for supportability, manufacturability, reliability, etc. Quality function development and quality control concepts. 4 lectures. Crosslisted as AERO/IME 511.

AERO 512. Aerospace Vehicle Software Application. 4 units

Term Typically Offered: W

Prerequisite: AERO 510, AERO 546 and graduate standing.

Computer system requirements for aerospace vehicles. Typical aerospace vehicle computer architectures. Software testing, verification and validation. Vehicle automatic systems. Risks and benefits of vehicle autonomous operations. Integration of software with vehicle subsystems. Software development cost/schedule estimation. 4 lectures.

AERO 513. Applications of Unmanned Aircraft Systems. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Engineering development and analysis of unmanned aircraft systems (UAS) as airborne tools for societal benefit. Use of UAS for military, public service, and commercial purposes. Characterization of missions and applications. Development of system requirements and concepts of operation. Evaluation of relative merits and limitations of UAS. 4 lectures.

AERO 515. Continuum Mechanics. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor.

Vectors and tensors stress analysis. Analysis of deformation. Velocity fields and compatibility conditions. Constitutive equations. Isotropy. Mechanical properties of real fluids and solids. Field equations and boundary conditions in fluid mechanics problems and applications in elasticity. Active remodeling of structures. 4 seminars.

AERO 517. Multidisciplinary Design and Optimization. 4 units

Term Typically Offered: W

Prerequisite: Familiarity with programming in Matlab and graduate standing or consent of instructor.

Numerical optimization applied to the design of complex systems. Multi-criteria decision making, unconstrained and constrained optimization methods, system sensitivity analysis, system decomposition techniques, and multidisciplinary design optimization. 4 lectures.

AERO 519. Fundamentals of Vehicle Dynamics and Control. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor.

Fundamentals of particle and rigid body dynamics as they apply to aerospace vehicles. Kinematic variables and coordinate transformations. Attitude dynamics. Fundamentals of feedback control and its application to aerospace systems. Stability analysis. Numerical simulation. Not open to students with credit in AERO 451 and AERO 452. 4 lectures.

AERO 522. Boundary-Layer Theory. 4 units

Term Typically Offered: SP

Prerequisite: AERO 302, graduate standing or consent of instructor.

Concept of boundary-layer. Boundary-layer equations, similarity transformation, integral and differential methods for steady, two-dimensional laminar and turbulent boundary layers. 4 lectures.

AERO 523. Turbulence. 4 units

Term Typically Offered: W

Prerequisite: AERO 302, graduate standing or consent of instructor.

Flow physics of turbulence. Turbulence scales and structures. Reynolds equations. Vorticity dynamics. Energy production, convection, and dissipation. Similarity rules and turbulence modeling for jets, wakes, mixing and boundary layers. Effect of turbulence on noise, combustion, heat transfer, and flow control. Not open to students with credit in AERO 529. 4 lectures.

AERO 525. Computational Fluid Dynamics. 4 units

Term Typically Offered: W

Prerequisite: AERO 303, graduate standing or consent of instructor.

Classification of partial differential equations. Numerical methods applicable to the solution of elliptic, parabolic, and hyperbolic partial differential equations. Consideration of accuracy and stability of numerical methods. Application to the fundamental equations of fluid dynamics, grid generation, turbulence modeling. 4 lectures.

AERO 526. Spacecraft Thermal/Fluid Control. 4 units

Term Typically Offered: W

Prerequisite: AERO 299 or AERO 301; AERO 302; AERO 303; or graduate standing.

Satellite thermal/fluid control hardware. Governing equations for flow and heat transfer. Surface tension and liquid/vapor interface. Heat transfer by free convection, forced convection and radiation in low-gravity environment. Heat pipes. Capillary-pumped loops. Cryogenic systems. Fluid management in space. 4 lectures.

AERO 528. Laminar Flow Aircraft Development. 4 units

Term Typically Offered: F

Prerequisite: AERO 306 and AERO 307; or graduate standing.

Fundamentals of laminar boundary layers in the design of aircraft. History and development of laminar flow aircraft. Modern approaches to designing for laminar flow. Analysis and testing of laminar flow designs and determination of practical limits for laminar flow application. 4 lectures.

AERO 529. Turbulence and Flow Control. 4 units

Term Typically Offered: W

Prerequisite: AERO 307 and AERO 406 for students in a BMS program; or graduate standing. Recommended: AERO 522 and AERO 525.

Physics and analysis of turbulence. Vorticity, mixing, jets, wakes, boundary layer transition, scales and structures. Effects of turbulence on noise and aerodynamics. Experiments and simulations in boundary layer transition, separation phenomena, passive and active flow control. Not open to students with credit in AERO 523. 2 lectures, 2 laboratories.

AERO 531. Airworthiness and Aeroelasticity. 4 units

Term Typically Offered: F

Prerequisite: AERO 431 and Graduate standing.

Fundamentals of airworthiness and aeroelasticity of flight vehicles. Flight envelope and aircraft loads. Loads and normal acceleration for various maneuvers. Gust loads. Load distribution and diversions. Control effectiveness and reversal. Fatigue and structural vibration. Introduction to flutter. 3 lectures, 1 laboratory.

AERO 532. Advanced Aerospace Composite Design. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing or consent of instructor.

Behavior of composite materials. Bending, buckling, and vibration of laminated plates. Fatigue and fracture mechanics analysis of composite structures. Optimum design of composite pressure vessels. 2 seminars, 2 laboratories.

AERO 533. Finite Elements for Aerospace Structural Analysis. 4 units

Term Typically Offered: SP

Prerequisite: AERO 431.

Overview of theoretical and applied methods of finite element analysis for aerospace structures including composite and light weight structures. Topics include basic equations of elasticity, solutions of linear systems of equations transformation, global stiffness matrix, Bernoulli-Euler element, plane stress triangles, finite element formulation, isoparametric elements, alternative formulation, eigenvalue problems and dynamic analysis. 3 lectures, 1 laboratory.

AERO 534. Aerospace Structural Dynamics Analysis. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing.

Structural dynamics and aeroelasticity of flight vehicles. Vibration and forced response of continuous structures. Introduction to unsteady aerodynamic analysis methods. Normal-Mode Method and Modal Analysis. Framed structures and rigid body structures. Airworthiness and aeroelasticity. Random Vibrations. 3 lectures, 1 laboratory.

AERO 535. Advanced Aerospace Structural Analysis. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor.

Types of failure. Theories of failure. Stability of structures. Advanced flight vehicle and fracture mechanics analysis and design. Fundamentals and applications of modern fatigue analysis in the aerospace industry. 3 lectures, 1 laboratory.

AERO 540. Elements of Rocket Propulsion. 4 units

Term Typically Offered: W

Prerequisite: AERO 303, AERO 401, graduate standing or consent of instructor.

Thrust and impulse equations, propellant composition and mixture ratios, nozzle expansion ratios, solid and liquid propellant combustion, internal ballistics, thermo-chemical computations, chemical kinetics, and combustion instability, nozzle design and exhaust plumes. 4 seminars.

AERO 541. Air Breathing Propulsion. 4 units

Term Typically Offered: SP

Prerequisite: AERO 401, graduate standing or consent of instructor.

Aerothermodynamics of propulsion systems, power plant selection and design, on-off design performance, component characterization, component design, component matching, optimization, and introduction to power plant and airframe integration systems for aircraft. 4 seminars.

AERO 546. Spacecraft Systems Design. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing.

Spacecraft missions, vehicle types, and applications. Introduction and preliminary sizing of major subsystems of a space system. Introduction to and design drivers for space environments, propulsion system, power system, structural design, spacecraft dynamics and attitude control, orbit mechanics, thermal control, communications, and ground segments. 4 lectures.

AERO 551. Global Positioning Satellite Navigation Systems. 4 units

Term Typically Offered: SP

Prerequisite: AERO 420, graduate standing or consent of instructor.

Principles of Global Positioning Satellite navigation systems. Kalman filter design and application to integrated navigation and guidance systems. Statistical evaluation and test methods in aerospace. Interactive computer simulations. 3 lectures, 1 laboratory.

AERO 553. Advanced Control Theory. 4 units

Term Typically Offered: W

Prerequisite: AERO 320 and graduate standing.

Advanced control theory techniques. Analytical and computational methods applied to dynamic systems. State space system representation, solutions to dynamic systems, non-linear and linear stability analysis, full-state and output feedback, controllability and observability and advanced control topics (LQR/LQG, Kalman Filters, Adaptive Control, etc.). 4 lectures.

AERO 557. Advanced Orbital Mechanics. 4 units

Term Typically Offered: W

Prerequisite: AERO 351 and graduate standing.

Initial orbit determination using angles only methods. Various Solutions to Lambert's Problem. Orbit and transfer optimization, libration points, halo orbits, and secondary orbit perturbations. 4 lectures.

AERO 560. Advanced Spacecraft Dynamics and Control. 4 units

Term Typically Offered: W

Prerequisite: AERO 421 and graduate standing.

Attitude determination and control of rigid spacecraft via reaction wheels, control moment gyros and thrusters. Modeling, analysis and control of flexible spacecraft. Non-linear stability theory as applied to spacecraft. 4 lectures.

AERO 561. Vehicle Integration and Testing. 2 units

Term Typically Offered: F

Prerequisite: AERO 446 and graduate standing or consent of instructor.

Recommended: AERO 450.

Space vehicle integration requirements and procedures. Clean room requirements and operations. Quality control and inspection. Qualification and acceptance testing requirements. Test equipment. Vibration and shock testing. Space environment and thermal-vac testing. Development of test procedures. 1 lecture, 1 laboratory.

AERO 562. Space Operations. 2 units

Term Typically Offered: F

Prerequisite: AERO 446 and graduate standing or consent of instructor.

Recommended: AERO 450.

Launch operations and vehicle integration with launch vehicle. In-orbit operations and maneuvers. Spacecraft tracking. Telemetry and command. Ground systems. Failure detection and identification. Emergency operations. 1 lecture, 1 laboratory.

AERO 565. Advanced Topics in Aircraft Design. 4 units

Term Typically Offered: SP

Prerequisite: AERO 522 and graduate standing; or consent of instructor.

Application of advanced analytic engineering methods to aircraft design problems. Analysis and synthesis of advanced topics related to design of aircraft. 4 lectures.

AERO 566. Advanced Topics in Spacecraft Design. 4 units

Term Typically Offered: F

Prerequisite: AERO 510, AERO 546, and graduate standing.

Application of advanced engineering tools to the design of space vehicles. System architecture and mission design. Concept of operations. Requirements development and flow down. System and subsystems trade studies and preliminary design. 4 lectures.

AERO 567. Launch Vehicle and Missile Design. 4 units

Term Typically Offered: SP

Prerequisite: AERO 401, AERO 450, AERO 446, graduate standing or consent of instructor.

Basic launch vehicle/missile types. Launch vehicle subsystems and their interactions. Vehicle requirements development and flow down. Payload accommodations. System and subsystems trade studies and preliminary design. 4 lectures.

AERO 568. Aerodynamic Research and Development I. 2 units

Term Typically Offered: W

Prerequisite: AERO 307, AERO 406, and graduate standing.

Recommended: AERO 525.

Immersive team-based approach to an aerodynamic research and development cycle. Theoretical work, preliminary design based upon computational fluid dynamics, and design of experiments. Advanced techniques in using a multi-variable wind tunnel. Validation of numerical work using correlation techniques. 2 laboratories.

AERO 569. Aerodynamic Research and Development II. 2 units

Term Typically Offered: SP

Prerequisite: AERO 568. Recommended: AERO 529.

Continuation of AERO 568. Single and multi-variable design optimization cycles based upon computational fluid dynamics. Numerical and experimental flow visualization, high-fidelity verification wind tunnel testing of optimized designs, and archival-quality technical reporting of aerodynamic data. 2 laboratories.

AERO 570. Selected Advanced Topics. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

AERO 571. Selected Advanced Topics Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

AERO 593. Cooperative Education Experience. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only.

AERO 594. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only.

AERO 595. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only.

AERO 596. Culminating Experience in Space Systems Engineering. 5 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing.

Performance of comprehensive systems analysis of a space system. Communication of the results and findings of such evaluations in written report and by oral presentation. Conducted under supervision of faculty.

AERO 599. Thesis (Design Project). 1-9 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing.

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis.

Agribusiness (AGB)

AGB Courses

AGB 101. Introduction to Agribusiness. 4 units

Term Typically Offered: F

Prerequisite: AGB major and freshman standing.

Orientation to the agribusiness sector of agriculture. An overview of the breadth, size, scope and management aspects of the agricultural business complex. Agribusiness students are required to complete this within the first year of the major. 4 lectures.

AGB 200. Special Problems for Undergraduates. 1-2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit can only be used to satisfy free electives. Credit/No Credit grading only.

AGB 202. Introduction to Sales. 4 units

Term Typically Offered: F, W, SP

Development of professional business-to-business selling principles within the supply chain, including an introduction to understanding the sales process from different buying and selling perspectives, communication techniques, and basic sales competency. 4 lectures.

AGB 212. Agricultural Economics. 4 units

Term Typically Offered: F, W, SP

Theoretical development of factors affecting demand and supply for food and fiber and for agricultural inputs. Methods of selecting optimal levels of agricultural production and consumption variables. Evaluation of market structure and price formulation for agricultural products and resources. 4 lectures.

AGB 214. Agribusiness Financial Accounting. 4 units

Term Typically Offered: F, W, SP

Principles of financial accounting in agribusiness. Preparation for understanding and interpreting financial statements. Exploration of financial reporting standards to provide an understanding of how financial events are reflected in financial statements. The importance of social responsibility in accounting. The accounting cycle, from transactions posting to financial statements through spreadsheet applications. 3 lectures, 1 activity.

AGB 260. Agribusiness Data Literacy. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: AGB 101 or junior standing.

Using data and analysis in making decisions related to agribusiness. Developing basic and intermediate spreadsheet skills necessary to organize, analyze, and summarize information. Development of data management and analysis as tools to assist in agribusiness problem-solving. 4 lectures.

AGB 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

AGB 301. Food and Fiber Marketing. 4 units

Term Typically Offered: F, W, SP

Prerequisite: AGB 212 or ECON 221.

Food and fiber marketing, examining commodity, industrial, and consumer product marketing from a managerial viewpoint. A global perspective in understanding consumer needs and developing the knowledge of economic, political, social and environmental factors that affect food and fiber marketing systems. 4 lectures.

AGB 308. Introduction to Agribusiness Finance. 4 units

Term Typically Offered: F, W, SP

Prerequisite: AGB 214 and AGB 260.

Concepts and analytical methods related to agricultural finance. Focus on applied spreadsheet analysis of financial statements, time value of money, risk and return, portfolio theory, and capital budgeting within the context of financial institutions specific to agriculture. Not open to students with credit in AGB 310. 4 lectures.

AGB 309. Advanced Sales Techniques. 4 units

Term Typically Offered: W

Prerequisite: AGB 202.

Expansion of basic sales principles and skills, focusing on prospecting, sales styles, pipelining, forecasting, and product planning. 4 lectures.

AGB 310. Agribusiness Credit and Finance. 4 units

Term Typically Offered: F, W, SP

Prerequisite: AGB 214 or BUS 212 or BUS 214.

Financing California's agricultural industry. Sources of credit and types of loans used by agribusinesses. Costs of credit. Financial analysis of agricultural borrowers. Future and present value techniques used in evaluating agricultural investments. Agricultural financial management. Financial capital markets and leasing. Not open to Agricultural Business majors. Not open to students with credit in AGB 308. 4 lectures.

AGB 311. Intermediate Agribusiness Finance. 4 units

Term Typically Offered: W, SP

Prerequisite: AGB 260 and AGB 310; or AGB 308.

Financial tools applied to the agribusiness industry, focusing on unique risks in agriculture. Risk and return in the production and processing sectors, working capital management, cash flows and financial statement forecasting for agribusiness firms, using spreadsheet analysis. 4 lectures.

AGB 312. Agricultural Policy. 4 units

Term Typically Offered: F, W, SP

Prerequisite: AGB 212 and ECON 222.

Agricultural policy objectives and formulation, resource allocation and production adjustments. Survey of State and Federal agricultural policies as they influence the planning and practices of agribusiness. 4 lectures.

AGB 313. Agriculture Economic Analysis. 4 units

Term Typically Offered: F, W, SP

Prerequisite: AGB 212 and MATH 221.

Advanced agricultural microeconomics with emphasis on mathematical problem solving; production and cost functions, single and multiple input allocation, agricultural output combinations, agricultural market structures, and economies of size. 4 lectures.

AGB 314. Fair and Fair Facility Management. 4 units

Term Typically Offered: SP

Prerequisite: Upper division standing.

Fundamentals of the year round operation of a fair facility to include rental opportunities, master planning, and maintenance. Principles and procedures in planning, organizing, operating, and evaluating a fair. One day field trip required. 4 lectures.

AGB 318. Global Agricultural Marketing and Trade. 4 units

Term Typically Offered: F, SP

Prerequisite: AGB 301.

Analysis of international marketing opportunities for agricultural products. Strategies for enhancing the performance of U.S. agricultural exports/ imports. Impact of government trade policies and regulations, distribution systems, and the changing consumer. 4 lectures.

AGB 322. Principles of Agribusiness Management. 4 units

Term Typically Offered: TBD

Prerequisite: AGB 212 and AGB 214.

Organization and operation of agribusinesses. Identification of factors affecting profitability. Evaluation of the business for increased efficiency and profit. Application of budgeting to representative firms and independent analysis of an agribusiness. 3 lectures, 1 activity.

AGB 323. Agribusiness Managerial Accounting. 4 units

Term Typically Offered: F, W, SP

Prerequisite: AGB 214.

Agribusiness management with an emphasis on using accounting procedures that will provide useful information in making management decisions, setting objectives, and controlling operations. 3 lectures, 1 activity.

AGB 324. Agricultural Property Management and Sales. 4 units

Term Typically Offered: TBD

Prerequisite: AGB 308 or AGB 310.

Economic, legal and real estate principles in the investment, development, mortgaging and transferring of agricultural real estate. 3 lectures, 1 activity.

AGB 326. Rural Property Appraisal. 4 units

Term Typically Offered: F, W

Prerequisite: AGB 308 or AGB 310.

Methods of rural appraisal, including farms, ranches and other rural properties, use of county records, appraisal practice on different types of rural properties, discussions with professional appraisers. 3 lectures, 1 activity.

AGB 327. Agribusiness Data Analysis. 4 units

Term Typically Offered: F, W, SP

Prerequisite: STAT 251 and AGB 260.

Methods in agricultural business data analysis, including multiple regression analysis, analysis of variance, and time series analysis. Applications include agricultural price forecasting and estimation of the determinants of food and fiber demand. 3 lectures, 1 activity.

AGB 328. Decision Tools for Agribusiness. 4 units

Term Typically Offered: F, W, SP

Prerequisite: STAT 251 and AGB 260.

Development of agribusiness modeling techniques that are applied to solving a diverse and unique set of resource allocation issues encountered throughout the agricultural and food retail sectors. Techniques include linear programming, decision analysis, and computer simulations. 3 lectures, 1 activity.

AGB 331. Farm Accounting. 4 units

Term Typically Offered: TBD

Prerequisite: AGB 214.

Application of commercial accounting process to farm and ranch accounting problems. Emphasis on accounting systems that facilitate financial statement presentation, tax preparation and ADP enterprise analysis. Income tax laws pertaining to agriculture. 3 lectures, 1 activity.

AGB 339. Internship in Agribusiness. 1-12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of internship instructor.

Selected students will spend up to 12 weeks with an approved agricultural firm engaged in production or related agribusiness. Time will be spent applying and developing agribusiness functional and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only.

AGB 369. Agricultural Personnel Management. 4 units

Term Typically Offered: F, W, SP

Prerequisite: AGB 212 or ECON 201 or ECON 221; and junior standing.

Standard topics of California agricultural personnel management: recruitment; appraisal and performance evaluation; compensation; training and development; discipline; safety and health; labor relations; and immigration policy. Systemic approach to aspects of managing human capital, and how to implement human resource policies. Not open to students with credit in AGB 401. 4 lectures.

AGB 370. World Food Economy. 4 units

Term Typically Offered: TBD

Prerequisite: AGB 312 and AGB 313.

International agricultural production, economics, and distribution. Comparative and competitive advantage in world agriculture. Food security issues and regional analysis of agriculture policies. The future of agriculture from a global perspective. 4 lectures.

AGB 400. Special Problems. 1-2 units

Term Typically Offered: TBD

Prerequisite: Consent of department head or instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

AGB 404. Food Retail Management. 4 units

Term Typically Offered: F, SP

Prerequisite: AGB 301.

Uses and techniques in management of perishable and non-perishable food commodities at the retail level. Issues in traditional versus new models of retail with emphasis on the marketing mix. Introduction to vendor, category and shelf management. 4 lectures.

AGB 405. Agribusiness Marketing Research Methods. 4 units

Term Typically Offered: F

Prerequisite: AGB 301 and AGB 327.

Agricultural marketing research data collection and analysis. Emphasis on food sector market segmentation, product positioning, new product testing, sales forecasting, and marketing plan development through secondary and primary data sources. Experimental research design and implementation. 4 lectures.

AGB 406. Agribusiness Marketing Planning. 4 units

Term Typically Offered: F, SP

Prerequisite: AGB 301; and AGB 327 or AGB 328.

Development of agribusiness marketing plans in self-managed teams. Emphasis on developing presentation skills. Integration of marketing mix, particularly promotional elements in developing agribusiness marketing strategy emphasized. 4 lectures.

AGB 410. Agricultural Lending. 4 units

Term Typically Offered: W, SP

Prerequisite: AGB 308 or AGB 310; and AGB 323.

Structure and performance of the agricultural lending industry. Advanced agricultural loan analysis and risk assessment. Agricultural loan documentation, securitization of farm loans, and farm bankruptcy. Exploration of interest rate impacts on agricultural lending. 4 lectures.

AGB 411. Agribusiness Risk Management. 4 units

Term Typically Offered: F

Prerequisite: AGB 301, AGB 311, and AGB 328 or graduate standing.

Risk management strategies and tools applied to the agribusiness industry, focusing on risks in agriculture. Forward contracting, futures and options, swaps, crop insurance, trading and hedging strategies, and their applications to agribusiness problems. 4 lectures.

AGB 412. Advanced Agricultural Policy. 4 units

Term Typically Offered: SP

Prerequisite: AGB 312; and AGB 327 or AGB 328.

Agricultural resource allocation issues with emphasis on policies that impact the production of food and fiber and inputs used in their production. Special topics in agricultural resource allocation stressing issues and policies emphasizing economic externalities. 4 lectures.

AGB 422. Transportation and Logistics in Global Agribusiness. 4 units

Term Typically Offered: SP

Prerequisite: AGB 328.

Scope and elements of the agribusiness logistics system including supply and distribution channels, transportation, inventory, warehousing, packaging, and order processing. 4 lectures.

AGB 425. Agribusiness Supply Chain Management. 4 units

Term Typically Offered: W

Prerequisite: AGB 323; and AGB 327 or AGB 328.

Focus on the development and application of decision models in food supply chains with emphasis on demand forecasting, aggregate planning, inventory management (cycle and food safety), supply network design, transportation, coordination and sourcing. 4 lectures.

AGB 427. Advanced Agribusiness Data Analysis. 4 units

Term Typically Offered: TBD

Prerequisite: AGB 327 or AGB 328 or graduate standing and consent of instructor.

Advanced topics in agricultural business data analysis. Topics include advanced agricultural price analysis, advanced linear programming in agribusiness, and advanced agricultural business operations analysis. The Schedule of Classes will list the topic selected. 4 lectures.

AGB 440. Field Studies in Agribusiness. 2 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Visitation to selected agribusinesses. Organization, operation, services and problems considered. Can only be taken once for credit in the major.

AGB 445. Produce Marketing. 2 units

Term Typically Offered: SP

Prerequisite: Senior standing and AGB 301.

Directed group study of fresh fruit and vegetable marketing. Includes analysis of terminal markets, retail marketing (supermarkets, farmer's markets, roadside stands), limited preserving and ripening, grading and inspection, economics of transportation, international marketing. 2 seminars.

AGB 450. Agribusiness Strategy Formulation. 4 units

Term Typically Offered: TBD

Prerequisite: AGB 323; and AGB 327 or AGB 328.

Development of strategy for agribusinesses where an uncontrollable environment makes output and results highly unpredictable; emphasis on the total enterprise. Case analysis. 4 lectures.

AGB 452. Agricultural Market Structure and Strategy. 4 units

Term Typically Offered: SP

Prerequisite: AGB 313.

Development of skills for quantity and price determination in a noncompetitive setting. Emphasis on examining the agribusiness industry structures that exist and their effects on decision-making. The use of game theory demonstrated as a strategy formulation tool. 4 lectures.

AGB 455. Advanced Fair Management Seminar. 2 units

Term Typically Offered: TBD

Prerequisite: AGB 314.

Advanced studies in fair management with emphasis on budgets, contracts, entertainment, carnivals, exhibit programs, crowd control, master planning maintenance. 2 seminars.

AGB 460. Research Methodology in Agribusiness. 2 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or senior standing; AGB major; AGB 301; AGB 308 or AGB 310; AGB 312; AGB 313; AGB 323; and AGB 327 or AGB 328.

Empirical application of the scientific method as it relates to the design and development of Senior Project. Research plan is developed. First quarter of Senior Project. 2 seminars.

AGB 461. Senior Project. 2 units

Term Typically Offered: TBD

Prerequisite: AGB 460.

Completion of a project under faculty supervision. Research topics or projects typical of problems which graduates must solve in the agricultural, food and fiber industries. Project results are presented in a formal report. Minimum 60 hours total time.

AGB 462. Senior Project - Applied Agribusiness Problems. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing; Agricultural Business major; AGB 301; AGB 308 or AGB 310; AGB 312; AGB 313; AGB 323; and AGB 327 or AGB 328.

Selection and analysis of agribusiness problems and opportunities in directed group-based projects. Exploration of problems which agribusiness graduate students may encounter in marketing, finance, management and production in the food and fiber industry. Formal report and presentation required. 4 lectures.

AGB 463. Senior Project - Agribusiness Consulting. 4 units

Term Typically Offered: TBD

Prerequisite: Senior standing; Agricultural Business major; AGB 301; AGB 308 or AGB 310; AGB 312; AGB 313; AGB 323; and AGB 327 or AGB 328.

Client-centered course where self-managed teams develop solutions to agribusiness problems. Exploration of problems typical to those which agribusiness graduates may encounter in marketing, finance, management and production in the food and fiber industry. Formal report and presentation to client required. 4 lectures.

AGB 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

AGB 500. Individual Study in Agribusiness. 1-6 units

Term Typically Offered: TBD

Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

Advanced independent study planned and completed under the direction of a member of the Agribusiness faculty. Total credit limited to 6 units.

AGB 514. Agribusiness Managerial Leadership and Communication. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Current issues in agriculture addressed through the case analysis method. Emphasis on communication skills and leadership qualities, identifying key success requirements. 4 seminars.

AGB 539. Graduate Internship in Agribusiness. 1-9 units

Term Typically Offered: TBD

Prerequisite: Consent of internship instructor.

Application of theory to the solution of problems of agricultural production or related business in the field of Agribusiness. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units.

AGB 543. Agribusiness Policy and Program Analysis. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Economic, political, and social objectives of domestic agricultural policies and programs. Consequences of government's policies and programs to control production, allocate resources, support market prices, and provide benefits to food and fiber producers, marketers, and consumers. Topical analysis of current effort of government to direct agriculture. 4 seminars.

AGB 554. Food System Marketing. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Major issues facing the food system marketer. Vertical and horizontal linkages, pricing in agricultural markets, management of price risk through futures markets and hedging, and public policy and consumer impacts on the system. Student involvement through case studies simulations, and presentations. 4 seminars.

AGB 555. Technological and Economic Change in Agribusiness. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing, or consent of instructor.

Ramifications and impacts in agribusiness firms from technological and economic changes. Emphasis on specific agribusiness firms and their managerial process of dealing with problems and opportunities in the operational environments of economic, technology, political, global, domestic and marketing. 4 seminars.

AGB 563. International Agribusiness Trade and Development. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Agricultural trade dynamics in a world economy. Evaluation of multinational firms and unilateral and multinational government policy strategies in interacting with and expanding markets for agricultural trade. Agribusiness opportunities with social and institutional limitations; emphasis on environmental and sustainable trade issues. 4 seminars.

AGB 570. Selected Topics in Agribusiness. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 12 units. 1 to 4 seminars.

AGB 571. Selected Advanced Laboratory in Agribusiness. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

AGB 599. Thesis in Agribusiness. 1-9 units

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Systematic research of a significant problem in Agribusiness. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units.

Agricultural Communication (AGC)

AGC Courses

AGC 102. Orientation to Agricultural Communication. 2 units

Term Typically Offered: F

Orientation to the communication sector of agriculture. Overview of professional opportunities and skills needed for success in agricultural communications. Preparation of press releases and short articles, and development of a planned program of study. 2 lectures.

AGC 200. Special Problems in Agricultural Communication. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, studies or surveys of selected problems in Agricultural Communication/Agricultural Education. Total credit limited to 8 units, with a maximum of 4 units per quarter.

AGC 207. Software Applications for Agricultural Publications. 2 units

Term Typically Offered: W

Emphasis on software applications in agricultural communications, including basic Adobe Creative Suite techniques of InDesign and Lightroom, MS Word and Excel. Best practices in electronic delivery and print. Adobe Premiere video, blog template usage and cloud collaboration for professional agricultural communications. 1 lecture, 1 activity.

AGC 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

AGC 301. New Media Communication Strategies in Agriculture. 4 units

Term Typically Offered: W

Prerequisite: Junior standing. Recommended: JOUR 203, JOUR 205.

Exploration and implementation of emerging new media communication strategies and technologies to convey information on important issues in agriculture to a global audience. Focus on food and farming dialogues currently populating conversations about production agriculture. Adaptation of different writing styles based on requirements of the various new media channels. Analysis of metrics to measure level of engagement with desired audience. 3 lectures, 1 laboratory.

AGC 339. Internship in Agricultural Communications. 1-12 units
CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of internship instructor.

Selected Agricultural Communication students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only.

AGC 400. Advanced Special Problems in Agricultural Communication. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, studies or surveys of selected problems in Agricultural Communication/Agricultural Education. Total credit limited to 8 units, with a maximum of 4 units per quarter.

AGC 407. Agricultural Publications. 4 units

Term Typically Offered: F, SP

Prerequisite: JOUR 205 and AGC 207.

Integration of writing, editing, and layout skills in producing agricultural publications. Emphasis on using computer applications in designing publications. Total credit limited to 8 units. 2 lectures, 2 activities.

AGC 426. Presentation Methods in Agricultural Communication. 4 units

Term Typically Offered: F, W

Prerequisite: Completion of GE Area A2 with a grade of C- or better; and junior standing.

Development, delivery and evaluation of effective means of communication by use of a variety of presentation methods and the use of technology for effective communication. 2 lectures, 2 activities.

AGC 452. Current Trends and Issues in Agricultural Communication. 4 units

Term Typically Offered: F, SP

Prerequisite: Senior standing.

Presentations by experts from government, industry, and professional organizations. Focus on trends and issues that impact agriculture, in particular agricultural communication. Exploration of solutions to problems facing agricultural communication. Field trip required. 4 seminars.

AGC 461. Senior Project I. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: AGED 460.

Empirical application of the scientific method as it relates to the selection of a project. Projects typical of problems that graduates must solve in their field of employment. 1 seminar.

AGC 462. Senior Project II. 1 unit

Term Typically Offered: F,W,SP,SU

Prerequisite: AGC 461.

Completion of a project begun in AGC 461. Projects typical of problems that graduates must solve in their field of employment. Project results are presented in a formal report. 1 seminar.

AGC 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

AGC 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

AGC 500. Individual Study In Agricultural Communication. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

Advanced independent study planned and completed under the direction of a member of the Agricultural Education and Communication faculty. Total credit limited to 6 units.

AGC 539. Graduate Internship in Agricultural Communication. 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of internship instructor.

Application of theory to the solution of problems of agricultural production or related business in the field of Agricultural Communication. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units.

AGC 570. Selected Topics in Agricultural Communication. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 12 units. 1 to 4 seminars.

AGC 571. Selected Advanced Laboratory in Agricultural Communication. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

AGC 580. Special Problems in Agricultural Communication. 1-3 units

Term Typically Offered: TBD

Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

Individual study of modern issues and problems conducted through research, planning and development. Field problems and in-service study in agricultural industry encouraged. Final written report required. Total credit limited to 9 units with not more than 3 units in any one quarter.

Agricultural Education (AGED)

AGED Courses

AGED 102. Introduction to Agricultural Education. 2 units

Term Typically Offered: F

Overview of agricultural education career pathways including goals and purposes. Kinds of classes and types of programs. Qualifications essential to success in teaching agriculture. Planned program of studies to meet requirement for teaching agricultural science and related disciplines. 2 lectures.

AGED 200. Special Problems in Agricultural Education. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, studies or surveys of selected problems in Agricultural Communication/Agricultural Education. Total credit limited to 8 units, with a maximum of 4 units per quarter.

AGED 220. Agricultural Youth Conferences. 2 units

CR/NC

Term Typically Offered: W

Prerequisite: Consent of instructor.

Problems encountered and practices applied during the conduct of the annual FFA State Convention. Methods, procedures and materials adapted for use by the student in developing the committee system to produce conferences, conventions and workshops of all kinds and sizes. Total credit limited to 6 units. Credit/No Credit grading only. 2 activities.

AGED 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

AGED 303. FFA and Supervised Agricultural Experience. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing.

Historical, philosophical and social foundation of high school agricultural education as it relates to the classroom/laboratory instruction, leadership (FFA) and supervised agricultural experiences (SAEs). Application of integral components in developing a total program of agricultural education. Two day field study tour required. 2 lectures, 2 activities.

AGED 339. Internship in Agricultural Education. 1-12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of internship instructor.

Selected Agricultural Education students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only.

AGED 350. Early Field Experience in Agriculture Education. 2 units

Term Typically Offered: W, SP

Prerequisite: AGED 303; and junior standing.

Observation of the practices and techniques utilized by agriculture teachers in conducting organized instruction in high school classrooms, shops, school farms, and laboratories. Discussion of activities and programs unique to teaching agriculture in California secondary schools. Participation in public schools requires mandated fingerprint clearance. 2 seminars.

AGED 400. Advanced Special Problems in Agricultural Education. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, studies or surveys of selected problems in Agricultural Communication/Agricultural Education. Total credit limited to 8 units, with a maximum of 4 units per quarter.

AGED 404. Agricultural Leadership. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE D4, junior standing.

Emphasis upon equipping current and prospective leaders in agriculture with the background and skills to achieve their potential. Class members will assess their status as leaders and identify means to improve their effectiveness. Focus on the theoretical underpinnings of human motivation, personal leadership, and organizational development. 2 lectures, 1 activity.

AGED 410. Computer Applications in Agricultural Education. 2 units

Term Typically Offered: W

Prerequisite: AGED 102. Recommended: AGED 303.

Development of agricultural teacher candidate's teaching effectiveness utilizing computer applications. Analysis and specialization of hardware. Instruction in digital technology, network systems and software applicable to teaching agriculture at the secondary level. 2 activities.

AGED 412. Advanced Agricultural Leadership Development Practicum. 3 units

Term Typically Offered: SP

Prerequisite: Junior standing and consent of instructor.

Leadership team facilitates a campus event under the direction of the Agricultural Education and Communication Department. Team identifies goals, recruits students, organizes committees, addresses tasks, and conducts the event. Practical application of problem solving, critical thinking, communication and collaboration skills. Total credit limited to 6 units. 3 seminars.

AGED 424. Organizing and Teaching Agriculture. 3 units

Term Typically Offered: W

Prerequisite: AGED 438 and consent of instructor.

Determining course objectives, content, and calendar for use by the teacher in classroom, shop and field instruction while assigned to community schools. Concurrent with student teaching. 3 activities.

AGED 440. Student Teaching in Agricultural Education. 6-12 units
CR/NC

Term Typically Offered: F, W, SP

Off-campus assignment to a selected cooperating public school. Participation in all phases of agriculture teacher duties and activities including departmental organization and administration. Prior approval and appointment necessary. Total credit limited to 18 units. Credit/No Credit grading only.

AGED 441. Student Teaching Practicum. 2 units

Term Typically Offered: W

Prerequisite: Consent of instructor.

Problems encountered and practices applied during student teaching. Methods, procedures and materials adapted for use by the teacher concurrent with student teaching. 2 activities.

AGED 460. Research Methodology in Agricultural Education and Communication. 1 unit

Term Typically Offered: F, W

Prerequisite: Junior standing.

Introduction to the research process and topic selection as it relates to the design and development of the senior project within the Agricultural Communication and the Agricultural Sciences majors. 1 lecture.

AGED 461. Senior Project I. 1 unit

Term Typically Offered: W, SP

Prerequisite: AGED 460.

Empirical application of the scientific method as it relates to the selection of a project. Projects typical of problems that graduates must solve in their field of employment. 1 seminar.

AGED 462. Senior Project II. 1 unit

Term Typically Offered: F, SP

Prerequisite: AGED 461.

Completion of a project begun in AGED 461. Projects typical of problems that graduates must solve in their field of employment. Project results are presented in a formal report. 1 seminar.

AGED 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

AGED 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

AGED 481. Developing Digital Presentations for Instruction in Agricultural Education. 1 unit

Term Typically Offered: TBD

Prerequisite: Senior standing.

Directed group study and individualized projects in the design and development of digital presentations in technical agriculture for use in teaching and program public relations. Total credit limited to 3 units. 1 laboratory.

AGED 482. Teaching Resources and Curriculum Design. 1 unit

Term Typically Offered: TBD

Prerequisite: Senior standing.

Traditional academic and student-centered approaches to gaining resources and curriculum design. Methods of using, and the development of the knowledge and skills related to planning, implementation and assessing the high school agriculture curriculum. Organization and management and their relationship to education effectiveness and productivity. 1 lecture.

AGED 500. Individual Study in Agricultural Education. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

Advanced independent study planned and completed under the direction of a member of the Agricultural Education and Communication faculty. Total credit limited to 6 units.

AGED 501. Professional Seminar in Agricultural Education. 2 units

Term Typically Offered: F

Prerequisite: Admission to the Credential Programs in Single Subject Agriculture, or Agriculture Specialist, and/or the Masters of Agricultural Education.

Orientation to the Master of Agricultural Education program. Current requirements, processes, documentation, and discussion of expectations of pre-professional teacher candidates. Completion of formal documents for credentialing in California. 2 seminars.

AGED 513. Field Experience - Agricultural Education. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Prior approval and appointment.

Practice and techniques in management and supervision of programs in agricultural education. Relationships among students, staff, community and school groups. Budgeting, staffing, records, reporting. Student activities and Future Farmers of America programs. Total credit limited to 6 units.

AGED 520. Program Development in Agricultural Education. 3 units

Term Typically Offered: W

Prerequisite: Senior standing.

Approaches to the development of an integrated agricultural education program in the comprehensive high school, based on occupational opportunities and community needs. Philosophy, organization, and administration of programs. Development in curriculum, supervised occupational experience, student leadership such as Future Farmers of America, and summer programs. Field trip required. Course may be offered in classroom-based or online format. 3 seminars.

AGED 522. Laboratory Pedagogy in Agricultural Technology. 3 units

Term Typically Offered: F

Prerequisite: Senior standing.

Organizing agricultural technology laboratory instruction, curriculum, and facilities. Student demonstrations and presentations; assessment, analysis, and evaluation. Field trip required. Not open to students with credit in AGED 523. 1 seminar, 2 laboratories.

AGED 523. Laboratory Organization and Management in Agricultural Education. 3 units

Term Typically Offered: TBD

Prerequisite: Enrollment in MS degree in Agricultural Education.

Organizing and managing laboratories, including agriculture mechanics curriculum and determining course content. Student demonstrations and presentations; assessment, analysis, and evaluation. Course is designed for in-service secondary agriculture teachers. Field trip required. Not open to students with credit in AGED 522. 3 lectures.

AGED 524. Instructional Processes in Agricultural Education. 4 units

Term Typically Offered: F

Prerequisite: Admission to one of the following programs: the Single Subject Agriculture Credential, the Agriculture Specialist Credential, or the Master of Agricultural Education. Co-requisite: EDUC 412, EDUC 414, and EDUC 418. Recommended: AGED 303, and AGED 350.

Principles of agricultural teaching methods and developmentally-appropriate pedagogy. Daily and unit lesson plans incorporating content, teaching methods, and assessing learners. Accommodations for English learners and students with special needs. Class demonstrations in teaching procedures, analysis, assessment and reflection. Field trip required. 2 lectures, 2 activities.

AGED 525. Organizing Instruction for Growing and Selling Horticulture Products. 3 units

Term Typically Offered: TBD

Prerequisite: AEPS 120 or AEPS 230, and senior or graduate standing.

Skills and techniques of propagation and production of horticulture crops. Scheduling, growing media, construction and use of forcing structures, and plant identification. Marketing plans and promotions. Teaching methods, curriculum development, and identification of resources and materials for horticultural instruction. 3 lectures. Open to agricultural educators or credential students only.

AGED 526. Curriculum Development in Horticulture Science. 3 units

Term Typically Offered: TBD

Prerequisite: AGED 438 and senior standing. Recommended: EDUC 410, EDUC 412, EDUC 414, EDUC 416 and EDUC 418.

Development of curriculum that meets California high school ornamental horticulture instructional needs and provides foundation for student entry into the horticulture industry. Instructional methods for lecture and laboratory activities. Identification of teaching resources and instructional materials. 3 lectures.

AGED 530. Developing FFA and Supervised Agricultural Experience Programs in Secondary Education. 3 units

Term Typically Offered: SP

Prerequisite: Senior or graduate standing.

Integrating FFA and supervised agricultural experience programs into the curriculum. Career development event implementation; record book usage; officer and committee training; recruitment; retention; retreat and leadership training. Current national and state initiatives and experiential learning opportunities in the workplace and entrepreneurial settings. Not open to students with credit in AGED 330. 3 lectures.

AGED 536. Teaching Agriculture in Higher Education. 3 units

Term Typically Offered: W

Prerequisite: Graduate standing.

Selection and use of teaching strategies, methods/approaches, and techniques when planning, delivering, and evaluating instruction. Intended for graduate students interested in pursuing a faculty position in agriculture, as well as other disciplines in higher education. 3 seminars.

AGED 537. Enhancing Instruction in Agricultural Biology. 3 units

Term Typically Offered: TBD

Prerequisite: AGED 438 or consent of instructor, enrollment in agriculture teaching credential program or MS degree in Agricultural Education, or current agriculture teacher; undergraduate biology course (BIO 111 or equivalent).

Teaching methods of important biological concepts using agriculture as the context. Assisting agriculture teachers in identifying proper pedagogical strategies to integrate activities and laboratories into existing agriculture biology courses, including leadership development opportunities and activities. Emphasis on appropriate teaching methods and techniques, curriculum integration and application, and classroom resources. 3 seminars.

AGED 539. Graduate Internship in Agricultural Education. 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of internship instructor.

Application of theory to the solution of problems of agricultural production or related business in the field of Agricultural Education. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units.

AGED 540. Instructional Planning in Agriculture. 2 units

Term Typically Offered: SU

Prerequisite: AGED 524.

Prior to the first day of teaching agriculture, develop a plan for delivery of instruction in a program of agriculture in a K-14 educational setting. Instructional strategies will address the statewide Quality Criteria for Programs of Instruction in Agriculture.

AGED 570. Selected Topics in Agricultural Education. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 12 units. 1 to 4 seminars.

AGED 571. Selected Advanced Laboratory in Agricultural Education. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

AGED 580. Special Problems in Agricultural Education. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

Individual study of modern issues and problems conducted through research, planning and development. Field problems and in-service study in agricultural industry encouraged. Final written report required. Total credit limited to 9 units with not more than 3 units in any one quarter.

AGED 581. Graduate Seminar in Agricultural Education. 3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Group study of selected developments, trends and issues in the field of Agricultural Education. 3 seminars.

Agricultural and Environmental Plant Sciences (AEPS)

AEPS Courses

AEPS 101. Orientation to Horticulture and Crop Science. 2 units

CR/NC

Term Typically Offered: F

Understand the depth and breadth of horticulture, field crops, and plant protection careers. Examination of curricula within the department. Introduction to both student and professional organizations. Emphasis on curriculum and career planning. Required of all Horticulture and Crop Science students. Credit/No Credit grading only. 1 lecture, 1 activity.

AEPS 110. People, Pests and Plagues. 4 units

GE Area B2; GE Area B4

Term Typically Offered: F, W, SP

Introduction to the science of entomology, focusing on insect identification, biology, ecology, and interactions with humans. Insect pest and beneficial species, and their role in shaping how we live, work and eat. Not open to Agricultural and Environmental Plant Sciences majors or Wine and Viticulture majors (viticulture concentration). 3 lectures, 1 activity. Fulfills GE B2 & B4.

AEPS 120. Principles of Horticulture and Crop Science. 4 units

Term Typically Offered: F, W, SP

Introduction to horticulture and crop science. Basic plant processes, classification, anatomy, physiology, and biotechnology. Effect of environment on plants and how we control it. Introduction to plant growth including propagation, media, irrigation, nutrition, management, harvest, and post harvest handling. People's use of plants. Field trip required. 3 lectures, 1 laboratory.

AEPS 123. Landscape Installation and Maintenance. 4 units

Term Typically Offered: W

Prerequisite: AEPS 120.

Planting and maintenance of trees, shrubs, ground covers, perennial plantings, color beds, specialty plantings, and small turf areas. Site selection, cultural requirements, scheduling of maintenance activities, pruning, landscape renovation and irrigation system repair. Equipment operation, maintenance, and safety. Speakers from industry. 3 lectures, 1 laboratory.

AEPS 124. Plant Propagation. 4 units

Term Typically Offered: SP

Prerequisite: AEPS 120 and BOT 121.

Plant propagation practices with emphasis on understanding why practices are used, how they work, and how they are applied in commercial horticulture. Field trip required. 3 lectures, 1 laboratory.

AEPS 126. Landscape Construction. 3 units

Term Typically Offered: F

Prerequisite: AEPS 120.

Design, construction techniques, and materials used in landscape and horticulture construction. Material quantity estimating, sustainable building practices, construction material substitutions, tools and equipment associated with landscape and horticulture construction, and equipment safety. Field trip required. 2 lectures, 1 laboratory.

AEPS 127. Horticulture and Landscape Design. 4 units

Term Typically Offered: W

Aesthetic aspects of environmental horticulture, introduction to computer aided design, presentation techniques and garden history. Field trip required. 2 lectures, 2 laboratories.

AEPS 132. Pomology I. 4 units

Term Typically Offered: W

Prerequisite: AEPS 120.

Orchard design and development, cultural practices, physiological responses of trees to cultural practices, propagation and strategies to maximize orchard profitability and sustainability. Not open to students with credit in AEPS 250. 3 lectures, 1 laboratory.

AEPS 133. Pomology II. 4 units

Term Typically Offered: SP

Prerequisite: AEPS 132.

Analysis of production and management strategies for major fruit and nut crops in California. 3 lectures, 1 laboratory.

AEPS 150. Forage Crops. 4 units

Term Typically Offered: F

Forages as a world resource in food and animal production, soil and water conservation and sustainable agricultural systems. Forage use systems: pasture and range, green chop, silage, hay and cubes. Identification and management of limiting factors of forage plant growth. Botany of legumes and grasses. Grass, legume and weed identification. Forage crop improvement. Forage composition and quality. Antiquity factors. 3 lectures, 1 laboratory.

AEPS 175. Beekeeping. 3 units

Term Typically Offered: F, SP

Studies and exercises in the handling of European honey bees with special reference to pollination of commercial crops. Honey processing and marketing. Hive inspection and disease detection. 2 lectures, 1 laboratory.

AEPS 190. California Vegetable Production. 4 units

Term Typically Offered: SP

Prerequisite: AEPS 120.

History, botany, growth characteristics and climatic adaptation, pests, and harvesting methods for the most important vegetable crops grown in California. Use of transplants, plastic mulches and row covers in vegetable production. Current topics in agriculture important to the vegetable industry. Field trip to a major California vegetable production area required. Survey of vegetable production for Agricultural and Environmental Plant Sciences majors. 3 lectures, 1 laboratory.

AEPS 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total graduation credit limited to 4 units, with a maximum of 4 units per quarter. Report required.

AEPS 202. Fruit Enterprise Project. 2 units

CR/NC

Term Typically Offered: F, W, SP

Beginning field experience in management of orchards or honeybees. May include cultural practices, harvesting, processing, sales and marketing activities. Credit/No Credit grading only. 1 lecture, 1 activity.

AEPS 203. Organic Enterprise. 2 units

CR/NC

Term Typically Offered: F, W, SP

Beginning field experience in production and marketing of organic vegetable crops. May include cultural practices, harvesting, processing, sales and marketing activities. Credit/No Credit grading only. 1 lecture, 1 activity.

AEPS 204. Vegetable Enterprise Project. 2 units

CR/NC

Term Typically Offered: F, W, SP

Beginning field experience in vegetable production systems. May include cultural practices, harvesting, processing, sales and marketing activities. Credit/No Credit grading only. 1 lecture, 1 activity.

AEPS 210. Viticultural Practices. 2 units

Term Typically Offered: W, SP

Critical viticultural practices including planting, pruning, canopy management, fruit thinning, harvest, floor management, trellis and irrigation maintenance. 2 activities. Crosslisted as AEPS/WVIT 210.

AEPS 212. Environmental Horticulture Enterprise Project I. 2 units

CR/NC

Term Typically Offered: F, W, SP

Beginning field experience in environmental horticulture. Selection and completion of a management/production project. Credit/No Credit grading only. 1 lecture, 1 activity.

AEPS 215. Floral Design I. 3 units

Term Typically Offered: F, W

Fundamentals of theory, techniques and skills currently practiced in the floral industry. Intended as consumer education for non-majors as well as initial preparation for pre-professionals. Includes applied art principles, post-harvest care and handling practices, and proper use of florist tools and materials in developing basic designs. 1 lecture, 2 laboratories.

AEPS 225. Floral Design II. 3 units

Term Typically Offered: SP

Prerequisite: AEPS 215.

Expanded exploration and application of design theory to commercial products and services in the retail floral industry. Appropriate utilization of current sales and business practices in a florist setting. Advanced techniques and skills for construction of designs for weddings, advanced arrangements, and designs for events. 1 lecture, 2 laboratories.

AEPS 230. Environmental Horticulture. 4 units

Term Typically Offered: F

Technical information and recommendations for the residential horticulturist. Propagation, pruning, planting, media, fertilizers, pest and weed control, landscaping, maintenance, identification and care of ornamental plants. Being a wise horticultural consumer. Not open to Agricultural and Environmental Plant Sciences majors. 3 lectures, 1 laboratory.

AEPS 233. Plant Materials I. 4 units

Term Typically Offered: SP

Identification, habits of growth, cultural requirements, and use of ornamental plants in the landscape. 3 lectures, 1 laboratory.

AEPS 234. Plant Materials II. 4 units

Term Typically Offered: F

Identification, habits of growth, cultural requirements, and use of ornamental plants in the landscape. 3 lectures, 1 laboratory.

AEPS 240. Commercial Seed Production. 4 units

Term Typically Offered: SP

Prerequisite: AEPS 120 or AEPS 260.

Production of field and vegetable seed. Seed technology, germination, quality control, seed enhancement, storage and handling of seed, and seed laws. Field trip to a seed conditioning/seed enhancement facility required. 3 lectures, 1 laboratory.

AEPS 244. Precision Farming. 4 units

Term Typically Offered: W

Prerequisite: AEPS 133 or AEPS 190 or AEPS 260 or BRAE 237 or BRAE 239.

Precision agriculture applications. Integrating GIS, GPS, and remote sensing technologies with site-specific farming practices to optimize agricultural productivity. Field trip required. 3 lectures, 1 laboratory. Crosslisted as AEPS/BRAE 244.

AEPS 245. Horticultural Production Techniques. 3 units

Term Typically Offered: F

Applied principles of plant growth in relation to the production horticulture industry. Emphasis on container media, fertilizing practices, irrigation, plant growth regulators, and miscellaneous growing structures. 2 activities, 1 laboratory.

AEPS 250. California Fruit Growing. 4 units

Term Typically Offered: TBD

Interrelationship of climate and cultural techniques on orchard productivity. California's place in the international production-marketing scheme. Field trip required. Not open to Agricultural and Environmental Plant Sciences majors, or students with credit in AEPS 132. 3 lectures, 1 laboratory.

AEPS 260. Introduction to Vegetable Science. 4 units

Term Typically Offered: TBD

Environmental and cultural principles involved in the production of California vegetable crops; temperature, daylength and fertility effects on production and yield, use of plastic mulches and row covers, and use of transplants. Harvest principles and precooling methods. Not open to Agricultural and Environmental Plant Sciences majors or students with credit in AEPS 190. 3 lectures, 1 laboratory.

AEPS 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

AEPS 301. Principles of Landscape Design. 4 units

Term Typically Offered: TBD

Prerequisite: AEPS 127, and AEPS 233 or AEPS 234.

Introduction to basic principles and elements of residential landscape design, design theory, plant composition, creative problem solving, functional and aesthetic uses of landscape materials, client and maintenance criteria, and sustainable design concepts. Intermediate computer aided design drafting and drawing skills. 2 lectures, 2 laboratories.

AEPS 304. Introduction to Plant Breeding. 4 units

Term Typically Offered: W, SP

Prerequisite: AEPS 120 and STAT 218. Recommended: one of the following: AEPS 132, AEPS 190, AEPS 230, AEPS 245, AEPS 250, or WVIT 233.

Principles of qualitative and quantitative genetics useful in the development of new plant varieties. Procedures for the creation of genetic variability, testing procedures, and selection schemes for development of improved plant types. 4 lectures.

AEPS 312. Environmental Horticulture Enterprise Project II. 2 units
CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Field experience in environmental horticulture. Selection and completion of a management/production project under faculty supervision. Credit/No Credit grading only. 1 lecture, 1 activity.

AEPS 313. Agricultural Entomology. 4 units

Term Typically Offered: F, SP

Prerequisite: AEPS 120 or BOT 121; and one of the following: CHEM 110, CHEM 111, or CHEM 127.

The science of entomology as it relates to insects of importance in agriculture. Focus on the biology, ecology and identification of insects and mites important to California horticulture, field crops and landscapes. 3 lectures, 1 laboratory.

AEPS 315. Organic Crop Production. 4 units

GE Area F

Term Typically Offered: F, SP

Prerequisite: Junior standing and completion of GE Area B.

Origins, application, regulation and technology of organic crop production. Theoretical and practical issues surrounding organic crop production from a cross-disciplinary perspective. Topics include the history of the organic movement; current regulation and certification; and field management practices and technologies. Features industry guest lecturers. 3 lectures, 1 activity. Crosslisted as AEPS/AG 315. Fulfills GE Area F.

AEPS 321. Weed Biology and Management. 4 units

Term Typically Offered: F, SP

Prerequisite: AEPS 120 or BOT 121.

Weed ecology, biology, and implications for management. Identification of weedy and invasive plant species in annual agricultural, perennial semi-managed, range, aquatic, and forest ecosystems, to elucidate weaknesses and strengths in order to facilitate vegetation management. Organic, cultural, biological, mechanical, and chemical methods and their integrated pest management (IPM) uses. 3 lectures, 1 laboratory.

AEPS 323. Plant Pathology. 4 units

Term Typically Offered: F, SP

Prerequisite: BIO 162 or BOT 121.

Comprehensive study of the causes and effects of disease in plants. Designed to lead to an understanding of the science and modern control methods. 2 lectures, 2 laboratories. Crosslisted as AEPS/BOT 323.

AEPS 327. Vertebrate Pest Management. 4 units

Term Typically Offered: W

Prerequisite: Junior standing.

Vertebrate pests injurious to crops, livestock, forest products, wildlife, stored products and humans. Life habits, identification, control methods, and materials. Related laws and regulations. 3 lectures, 1 laboratory.

AEPS 329. Plants, Food, and Biotechnology. 4 units

GE Area F

Term Typically Offered: F

Prerequisite: Junior standing and completion of one of the following: AEPS 120, BIO 111, BIO 114, BIO 161, or BOT 121.

Agriculture as applied biology and its impact on civilization. Application of technology to increase the efficiency of food production. Genetics and biotechnology; culminating in an assessment of genetically engineered foods, the myths, the controversy, the science. Not open to Agricultural and Environmental Plant Sciences majors. 3 lectures, 1 laboratory. Crosslisted as AEPS/BOT 329. Fulfills GE Area F.

AEPS 331. Advanced Viticulture - Fall. 4 units

Term Typically Offered: F, SU

Prerequisite: AEPS/WVIT 231 or WVIT 232 or WVIT 233.

Advanced viticulture theory and practice, with an emphasis on fall season activities. Identification of rootstocks, wine and table grapes, species taxonomy and diversity, and breeding for grapevine improvement. Field trips required. 3 lectures, 1 laboratory. Crosslisted as AEPS/WVIT 331.

AEPS 332. Landscape Contracting. 4 units

Term Typically Offered: SP

Prerequisite: AEPS 126 and AEPS 127.

Practices in supervising personnel and applying standard techniques in landscape construction. Cost finding and estimating for landscape trades. 3 lectures, 1 laboratory.

AEPS 333. Greenhouse Vegetable Production. 2 units

Term Typically Offered: F

Prerequisite: AEPS 120; CHEM 111 or CHEM 127; and SS 221.

Development, practices, history, and future of crop production in greenhouses. Research applications, commercial applications, production problems, marketing, and economics. Special emphasis on growing transplants in greenhouses and use of nutrient solutions. Field trips to a commercial greenhouse operation and/or analysis lab required. 2 activities.

AEPS 339. Internship in Horticulture and Crop Science. 1-12 units
CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Selected Horticulture and Crop Science students will spend up to 12 weeks with an approved agricultural/horticultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only.

AEPS 340. Principles of Greenhouse Environment. 4 units

Term Typically Offered: SP

Prerequisite: AEPS 245.

Analysis of problems and practices affecting the contemporary commercial horticulturist. Analysis and operation of greenhouses and related equipment stressing the effect of environment on plant growth. Field trip required. 3 lectures, 1 laboratory.

AEPS 341. Cut Flower Production. 4 units

Term Typically Offered: F

Prerequisite: AEPS 120.

Production of cut flowers and other fresh florists' commodities in greenhouses and outdoors. Preparation and scheduling of such commodities for major markets. Field trip required. 3 lectures, 1 laboratory.

AEPS 342. Potted Plant Production. 4 units

Term Typically Offered: W

Prerequisite: AEPS 245.

Production of major commercial flowering potted plants in greenhouses and outdoors. Preparation and scheduling of potted flowering greenhouse crops for major markets. Field trip required. 3 lectures, 1 laboratory.

AEPS 343. Turfgrass Management. 4 units

Term Typically Offered: F

Prerequisite: AEPS 120 or BOT 121; and SS 121.

Turfgrass species and uses. Principles of turfgrass physiology and communities under different environments. Overview of procedures and equipment for propagation, mowing, irrigation, fertilization, aerification, and pest control. 3 lectures, 1 laboratory.

AEPS 350. Abiotic Plant Problems. 3 units

Term Typically Offered: W

Prerequisite: AEPS 124; CHEM 111 or CHEM 127; and SS 121.

Diagnosis of physiological disorders associated with environmental and nutritional factors. Particular emphasis on the systematic inquiry process. Case histories, multimedia use. 2 lectures, 1 laboratory.

AEPS 351. Experimental Techniques and Analysis. 4 units

Term Typically Offered: W

Prerequisite: Junior standing and MATH 118 or equivalent, and STAT 218.

Principal experimental designs used in agriculture and methods of statistical analysis of data collected from each. Statistical software. Field practice in planning and layout of typical experiments. 3 lectures, 1 laboratory.

AEPS 355. Citrus and Avocado Fruit Production. 4 units

Term Typically Offered: SP

Prerequisite: AEPS 120 or AEPS 250.

World citrus and avocado production and marketing. Orchard management techniques. Relationship of environment to species, cultivar, and rootstock selection. Field trip to a major California production area required. 3 lectures, 1 laboratory.

AEPS 381. Native Plants for California Landscapes. 4 units

Term Typically Offered: SP

Prerequisite: BOT 121 and junior standing.

Horticultural investigation of the California flora with emphasis on landscape use and potential. Plant recognition, identification, propagation and culture. Utilization of native plants in landscape design and habitat restoration. Field trip required. 3 lectures, 1 laboratory.

AEPS 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total degree credit limited to 4 units, with a maximum of 4 units per quarter. Report required.

AEPS 402. Fruit Enterprise Project Management. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: AEPS 202 and consent of instructor.

Advanced experience in production of orchards. Development and execution of a plan for field operations, fruit processing and/or marketing. Management decision-making. Total credit limited to 4 units. Credit/No Credit grading only. 1 lecture, 1 activity.

AEPS 403. Organic Enterprise Project Management. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: AEPS 203 and consent of instructor.

Advanced experience in production of organic vegetables. Development and execution of a plan for planting schedule, cultivation, harvest, and/or marketing. Management decision-making. Total credit limited to 4 units. Credit/No Credit grading only. 1 lecture, 1 activity.

AEPS 404. Vegetable Enterprise Project Management. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: AEPS 204 and consent of instructor.

Advanced experience in the production of vegetable crops. Development, management and implementation of cultural practices, harvesting, processing, sales and marketing activities for vegetable crops. Total credit limited to 4 units. Credit/No Credit grading only. 1 lecture, 1 activity.

AEPS 406. Advanced Weed Management. 4 units

Term Typically Offered: W

Prerequisite: AEPS 321.

Advanced coverage of sustainable weed and invasive plant management technologies. Concepts include environmental fates, plant metabolism, ecology and biology of weeds, and mechanisms of action of herbicides. Plant biotechnology as it relates to herbicide resistance in crops and weeds. 4 lectures.

AEPS 410. Crop Physiology. 4 units

Term Typically Offered: SP

Prerequisite: AEPS 120 or BIO 263; BIO 162 or BOT 121; and CHEM 216, CHEM 312 or CHEM 316.

Ecological and physiological interactions associated with the production of crop plants. Physiological and biochemical processes that elucidate the mechanism of whole plant performance and responses to the environment. 3 lectures, 1 laboratory.

AEPS 414. Grape Pest Management. 4 units

Term Typically Offered: F

Prerequisite: AEPS/WVIT 231, WVIT 232 or WVIT 233; AEPS 313; AEPS/BOT 323.

Comprehensive survey of major grape pests including diseases, insects, weeds, vertebrates, and nematodes. Identification and biology of grape pests and natural enemies, monitoring, and integrated pest management (IPM) strategies, including cultural, biological, and chemical controls. Guest lectures. 3 lectures, 1 activity. Crosslisted as AEPS/WVIT 414.

AEPS 421. Postharvest Technology of Horticultural Crops. 4 units

Term Typically Offered: W

Prerequisite: Junior standing.

Respiration, ethylene, ripening and senescence; modified atmosphere packaging, controlled atmosphere storage, packinghouses and transportation; survey of postharvest techniques to maximize commodity shelf-life. Field trip required. 3 lectures, 1 laboratory.

AEPS 423. Advanced Vegetable Science. 4 units

Term Typically Offered: TBD

Prerequisite: AEPS 190 or AEPS 260.

Agricultural land conservation; current laws impacting vegetable production and marketing. Environmental and cultural effects on selected vegetables including specific effects on growth, flowering, fruiting and yield. Field trip to desert vegetable production regions required. 3 lectures, 1 laboratory.

AEPS 424. Nursery Crop Production. 4 units

Term Typically Offered: W

Prerequisite: AEPS 124.

Comprehensive and historical overview of the nursery industry. Types of wholesale nurseries and their products. Plant production systems, scheduling, and marketing. Emphasis on medium to large woody plants and deciduous field-grown ornamental trees and shrubs in the western U.S. Field trip required. 3 lectures, 1 laboratory.

AEPS 425. Arboriculture. 4 units

Term Typically Offered: F

Prerequisite: AEPS 123, AEPS 233, and AEPS 234 or NR 208 for FNR majors.

Theory and practice for the care and management of ornamental trees. Selection, planting, establishment, maintenance of specimen trees. Professional use of ropes and safety equipment. Tree evaluation, scheduling cultural practices, bracing, cabling, specialty hand and power equipment operation, safety regulations. 2 lectures, 2 laboratories.

AEPS 427. Disease and Pest Control Systems for Ornamental Plants. 4 units

Term Typically Offered: W

Prerequisite: AEPS 120, AEPS 313, AEPS 321, and AEPS/BOT 323.

Recognition, prevention and control of diseases, insect/mite pests and weeds that impact commercial ornamental plantings. Integrated pest management strategies presented including biological, cultural, and safe and proper pesticidal controls. Laboratory emphasizes monitoring, problem solving and application of appropriate pest control measures. 3 lectures, 1 laboratory.

AEPS 431. Insect Pest Management. 4 units

Term Typically Offered: SP

Prerequisite: AEPS 313.

Principles of insect and mite pest management, including integrated pest management (IPM), applications of ecological theory to pest management, cultural, biological and chemical controls, pesticide resistance management, insect and mite monitoring, biotechnology applications, pesticide laws and regulations, pest control advisor and qualified applicator licensing and certification. Field trip required. 3 lectures, 1 laboratory.

AEPS 432. Specialized Operations for Golf Courses and Athletic Fields. 4 units

Term Typically Offered: TBD

Prerequisite: AEPS 343.

Advanced maintenance and operation of golf course facilities and athletic field complexes. Specialized turf establishment and maintenance, environmental concerns, finance and personnel management, and professional development. Field trip required. 3 lectures, 1 laboratory. Not open to students with credit in AEPS 430 or AEPS 433.

AEPS 434. Landscape Management. 4 units

Term Typically Offered: TBD

Prerequisite: AEPS 123 and AEPS 126 and junior standing.

Maintenance procedures and operations. Operating a landscape management business. Estimating, scheduling, recordkeeping and implementation of landscape maintenance projects. Interior landscape maintenance. 3 lectures, 1 laboratory.

AEPS 435. Advanced Landscape Design. 4 units

Term Typically Offered: TBD

Prerequisite: AEPS 233, AEPS 234, AEPS 301. Recommended: AEPS 381.

Advanced principles of landscape design for residential properties. Design process, form, and space composition emphasized. Application of sustainable design concepts. Computer aided design applications, including three-dimensional design, emphasized. Field trip required. 2 lectures, 2 laboratories.

AEPS 437. Park and Public Space Management. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Management and maintenance of private and public parks, arboreta, botanical gardens and recreational areas. Maintenance personnel management, safety and liability issues. Field trips required. 3 lectures, 1 laboratory.

AEPS 441. Biological Control for Pest Management. 4 units

Term Typically Offered: F

Prerequisite: AEPS 313.

Control of arthropods, weeds and vertebrates to include history of biocontrol; biology of beneficial arthropods; methods of introduction, augmentation and conservation; and case studies. Identification of beneficial arthropods to appropriate taxonomic level. Technology, laws and regulations governing use of biocontrol agents. Field trips to insectaries, quarantine facilities and/or crop production areas. 3 lectures, 1 laboratory.

AEPS 445. Cropping Systems. 4 units

Term Typically Offered: W

Prerequisite: AEPS 120; or BOT 121 and SS 121; or graduate standing.

Classification and description of agricultural systems of the world. Cropping systems as land management plans. Systems approaches to improvement of agricultural situations. Consideration of human factors and the agroecosystem in efforts to create a more sustainable agriculture. Field trip required. 3 lectures, 1 activity.

AEPS 461. Senior Project I. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing, completion of GE Area A1 with a grade of C- or better, and STAT 218.

Initial information research for project definition and development. Projects are typical of problems which graduates must solve in their fields of study or employment. Project results are presented in AEPS 462. Contract drawn up with approval of advisor. 2 lectures.

AEPS 462. Senior Project II. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Continuation of Senior Project development. Write-up of rough draft and formal draft of project. Completion of formal written report under advisor supervision. Minimum 60 hours.

AEPS 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: SP

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-4 lectures.

AEPS 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

AEPS 500. Individual Study in Horticulture and Crop Science. 1-6 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Advanced independent study planned and completed under the direction of a member of the Horticulture and Crop Science faculty. Total credit limited to 6 units.

AEPS 539. Graduate Internship in Horticulture and Crop Science. 1-9 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Application of theory to the solution of problems of agricultural production or related business in the fields of horticulture and crop science. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units.

AEPS 570. Selected Topics in Horticulture and Crop Science. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1-4 seminars.

AEPS 571. Selected Topics Laboratory in Horticulture and Crop Science. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1-4 laboratories.

AEPS 575. Applied Systematics for Agriculture. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing. Recommended: a course in basic entomology, plant pathology, and weed science.

The application of evolutionary, phylogenetic, taxonomic and biogeographic principles as they pertain to current agricultural issues in the US. Attention is given to invasive species and their impact on California's agricultural industry. The course focus is insects, but invasive plants and microorganisms are also addressed. 4 seminars.

AEPS 581. Graduate Seminar in Crop/Fruit Production. 3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Group study of current problems, trends and research results pertaining to production or marketing of field, vegetable or fruit crops. 3 seminars.

AEPS 596. Thesis in Crop Science. 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor.

Systematic research of a significant problem in Crop Science. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units.

AEPS 597. Thesis in Environmental Horticulture Science. 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor.

Systematic research of a significant problem in environmental horticulture. Thesis will include problem identification, significance, methods, data analysis and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units.

AEPS 598. Thesis in Fruit Science. 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor.

Systematic research of a significant problem in Fruit Science. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units.

AEPS 599. Thesis in Plant Protection Science. 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor.

Systematic research of a topic in plant protection science, including weed science, entomology, plant pathology, nematology or vertebrate management. Thesis to describe the problem and its significance, methodology, results, data analysis, discussion and conclusion. Enrollment required every quarter in which facilities are used or advisement received. Degree credit limited to 6 units. Total credit limited to 9 units.

Agriculture (AG)

AG Courses

AG 200. Special Problems for Undergraduates. 1-2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of rodeo coach/instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit can only be used to satisfy free electives. Credit/No Credit grading only.

AG 210. Agricultural Leadership Experience. 1 unit

Term Typically Offered: F, W, SP

Participation in activities that promote personal growth and leadership development, including team work, cooperation, communication, problem solving, time management, and organization. Support CAFES in recruitment, public awareness, educational programs, campus tours, fundraising, and youth career development events. The Class Schedule will list topic selected. Total credit limited to 2 units. 1 activity.

AG 212. Leadership Practice: Poly Royal Rodeo. 3 units

Term Typically Offered: W

Application of the management and operations of the Poly Royal Rodeo event taking place during Open House at Cal Poly. Principles and procedures in planning, organizing, financing, promoting, and managing a major collegiate rodeo and the rodeo industry are discussed. 1 lecture, 2 activities.

AG 243. Theory and Practice of Rodeo. 2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of rodeo coach/instructor.

Beginning through advanced skills in the event areas of college rodeo. Areas include saddle bronc, bareback, and bull riding; calf, team, and breakaway roping; steer wrestling, goat tying, and barrel racing. Minimum of 10 hours of laboratory per week. Total credit limited to 8 units. Credit/No Credit grading. Enrollment limited to those qualified to compete in intercollegiate rodeo.

AG 254. Introduction to Agricultural Leadership. 2 units

Term Typically Offered: SP

Orientation to leadership development in agriculture and related settings. Principles and techniques for developing leadership skills, including exploration of personal characteristics, technical skills, interpersonal influence, commitment, goals, and power necessary for effective leaders. Issues facing leaders in agriculture. 2 lectures.

AG 315. Organic Crop Production. 4 units

GE Area F

Term Typically Offered: SP

Prerequisite: Junior standing and completion of GE Area B.

Origins, application, regulation and technology of organic crop production. Theoretical and practical issues surrounding organic crop production from a cross-disciplinary perspective. Topics include the history of the organic movement; current regulation and certification; and field management practices and technologies. Features industry guest lecturers. 3 lectures, 1 activity. Crosslisted as AEPS/AG 315. Fulfills GE Area F.

AG 330. Cal Poly Land: Nature, Technology, and Society. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area B.

Scientific investigation of the natural features of the Cal Poly landscape and their transformations by land management technology. Analysis of the environmental, economic, social, and political effects of agriculture, resource extraction, and construction technology on that landscape. Emphasis on the educational, land-use, and long term planning issues of technology presented by this case study. 4 lectures. Crosslisted as AG/ISLA/UNIV 330. Fulfills GE Area F.

AG 339. Internship in Agriculture. 1-12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of internship instructor.

Selected students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Credit/No Credit grading.

AG 350. The Global Environment. 4 units

GE Area F

Term Typically Offered: F

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area B.

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 4 lectures. Crosslisted as AG/EDES/ENGR/GEOG/ISLA/SCM/UNIV 350. Fulfills GE Area F.

AG 360. Holistic Management. 4 units

GE Area F

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and completion of GE Area B.

Application of holistic management, a goal-oriented, value-driven framework for making decisions that are ecologically, economically, and socially sound. Impact of technology and other tools on ecosystem processes. Holistic approach to management, especially of land-based resources, aimed toward greater biodiversity and sustainability. Not open to students with credit in AG 450. 3 lectures, 1 laboratory. Crosslisted as AG/ASCI 360. Fulfills GE Area F.

AG 400. Special Problems for Advanced Undergraduates. 1-2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of rodeo coach/instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading only.

AG 410. Advanced Agricultural Leadership Experience. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: AG 210.

Activities that promote personal growth and development from a leadership perspective. Special attention on recruiting, organizing, and engaging volunteers. Teambuilding, cooperation, communication, problem solving, time management, and organization skills are emphasized. Guiding students in serving others in major student activities. The Class Schedule will list topic selected. Total credit limited to 2 units. 1 activity.

AG 412. Advanced Leadership Practice: Poly Royal Rodeo. 3 units

Term Typically Offered: W

Prerequisite: AG 212.

Management and oversight of AG 212 and Poly Royal Rodeo. Emphasis on becoming proficient in working as leaders and as a team with a focus on problem-solving. Annual evaluation of events and planning for the following year's event while successfully mentoring new students. 1 lecture, 2 activities.

AG 413. Committee Management: Poly Royal Rodeo. 2 units

Term Typically Offered: SP

Prerequisite: AG 412.

Continued management of the Poly Royal Rodeo during Open House. Oversight of volunteers and committee members as well as interacting with attendees of the event. Emphasis on leadership and problem solving while working toward building a new management team. 1 lecture, 1 activity.

AG 450. Applied Holistic Management. 4 units

Term Typically Offered: F, W, SP

Prerequisite: One GE Area B2 course and junior standing.

Application of holistic management, a goal-oriented, value-driven framework for making decisions that are ecologically, economically, and socially sound. Impact of technology and other tools on ecosystem processes. Holistic approach to management, especially of land-based resources, aimed toward greater biodiversity and sustainability. Not open to students with credit in AG/ASCI 360. 3 lectures, 1 laboratory.

AG 452. Issues Affecting California Agriculture. 4 units

Term Typically Offered: W

Prerequisite: Junior standing.

Interactive seminars with speakers from government and industry covering policy and regulations affecting California agriculture. Students develop an understanding of agricultural policy and work in teams to develop a public presentation and position paper on a significant issue. Field trip to Sacramento required. 4 seminars.

AG 454. Agricultural Leadership Capstone. 2 units

Term Typically Offered: W

Prerequisite: AGED 404 and senior standing.

Culminating leadership experience. Appraise strengths and areas of personal growth, analyze effective strategies in leading others, examine collegiate experiences, and construct a leadership philosophy integrating the research-based leadership theory, skills and traits explored. 1 lecture, 1 activity.

AG 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 12 units. Credit/No Credit grading only.

AG 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 24 units. Credit/No Credit grading only.

AG 500. Individual Study. 1-6 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

Advanced independent study planned and completed under the direction of a member of the college faculty. Total credit limited to 6 units.

AG 539. Graduate Internship in Agriculture. 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of internship instructor.

Application of theory to the solution of problems of agricultural production or related businesses in the field. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units.

AG 581. Graduate Seminar. 1 unit

CR/NC

Term Typically Offered: W

Prerequisite: Graduate standing or consent of instructor.

Advanced topics in agriculture and natural resources. Group study of current research and industry trends. Invited speakers covering a variety of topics. Total credit limited to 3 units. 1 hour seminar.

AG 585. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only.

AG 595. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only.

AG 598. Reading and Conference. 1-12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and instructor consent.

Systematic development of an agricultural thesis research project including literature searches, reports and experimental design. Repeatable for up to 12 units. Credit/No Credit grading only.

AG 599. Thesis. 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor.

Systematic research of a significant problem. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units.

Animal Science (ASCI)

ASCI Courses

ASCI 101. Introduction to the Animal Sciences. 2 units

CR/NC

Term Typically Offered: F

Economic, environmental and societal impact of the livestock, poultry and horse industries. Basic terminology, anatomy, and physical requirements of animals. Career and academic planning. Co-curricular, extra-curricular, and post-graduate opportunities. Required of all first-time students in the Animal Science Department. Credit/No Credit grading only. 2 lectures.

ASCI 112. Principles of Animal Science. 4 units

GE Area B2

Term Typically Offered: F, W, SP

Comparative physiology of digestive, endocrine, and reproductive systems in animals. Principles of nutrition, genetics, growth and development, behavior, food processing/safety of animals. Current issues in animal agriculture including biosecurity, animal welfare, and governmental safeguards for animal and human health. 4 lectures. Fulfills GE B2 except for ASCI majors.

ASCI 200. Special Problems. 1-4 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. Credit/No Credit grading only.

ASCI 203. Animal Parasitology. 3 units

Term Typically Offered: SP

Prerequisite: BIO 111 or BIO 161.

Identification, life cycles, prevention and control of the common external and internal parasites causing economic loss in livestock. 3 lectures.

ASCI 211. Meat Science. 4 units

Term Typically Offered: F, W, SP

Muscle food processing methods and operations. Conversion of muscle to meat. Meat inspection, grading, composition, curing, preservation, food safety and related topics. Carcass beef, pork, and lamb processed into consumer ready products. 3 lectures, 1 laboratory.

ASCI 212. Livestock Show Management. 3 units

Term Typically Offered: W

Application of the management and operations of Cal Poly's Western Bonanza Livestock Show. Principles and procedures in planning, organizing, financing, promoting and managing a major livestock show and the fair industry. Total credit limited to 6 units. Not open to students with credit for ASCI 412 or ASCI 413. 1 lecture, 2 activities.

ASCI 214. Equine Management. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Application of safety, risk reduction, horsemanship skills. Develop a working equine/human relationship. Selection and application of nutrition, equipment, preventive health and farrier program, and equitation skills. 2 laboratories.

ASCI 220. Introductory Animal Nutrition and Feeding. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 111 or BIO 161; and CHEM 127.

Nutrient digestion and absorption; basic functions of major nutrient classes; NRC feed classification and feedstuff characteristics; Van Soest system of fiber analysis and practical applications; feed processing: effects on feeds and nutrient availability; nutrient requirements of animals; diet formulation techniques. 3 lectures, 1 laboratory.

ASCI 221. Introduction to Beef Production. 4 units

Term Typically Offered: F, SP

Survey of industry characteristics, breeds, market classes, production systems, and current issues facing the beef industry. 3 lectures, 1 laboratory.

ASCI 222. Systems of Swine Production. 4 units

Term Typically Offered: F, SP

Structure of the pork industry in the U.S.; production standards and new technologies; breed systems. Market classification, product quality and quality assurance. Swine behavior and husbandry systems; biosecurity, health and feeding systems and management. 3 lectures, 1 laboratory.

ASCI 223. Systems of Small Ruminant Management. 4 units

Term Typically Offered: W, SP

Sheep and goat industry overview, populations, trends, cultural implications, breed identification, nutritional, reproductive, health, marketing, and herd management of sheep and goats. Field trip may be required. 3 lectures, 1 laboratory.

ASCI 224. Equine Science. 4 units

Term Typically Offered: F, W, SP

History, status of the horse industry, breeds. Application of management skills, safety, conformation evaluation, hoof and leg conformation and care. Understanding equine behavior. Insurance and tax ramifications. Pedigree analysis. Alternate therapies. 3 lectures, 1 laboratory.

ASCI 225. Introduction to Poultry Management. 4 units

Term Typically Offered: F, W, SP

Introduction to modern techniques in poultry production, processing, marketing and price discovery. Consumption trends, breeds and consumer grades. Laboratory application of management skills, health care, keeping of production and accounting records and processing techniques. 3 lectures, 1 laboratory.

ASCI 226. Livestock Evaluation. 3 units

Term Typically Offered: SP

Utilization of objective and subjective estimation measures in establishing economic worth of domestic animals of the three meat animal species and horses. 1 lecture, 2 laboratories.

ASCI 227. Companion Animal Science. 4 units

Term Typically Offered: F

Companion animal anatomy and physiology, reproduction, nutrition, behavior, management, common parasites, and infectious diseases. Scientific method in studying the human-animal bond. Application of biological concepts to problems related to companion animals. Trends in pet industry including animal welfare issues. 3 lectures, 1 laboratory.

ASCI 228. Equine Evaluation. 2 units

Term Typically Offered: TBD

Appraisal of equine breeds at halter and in performance classes. Evaluate horse classes, decide their order of placement, and then orally justify these decisions to a judge. The relationship of equine anatomy and physiology on competitive performance. 2 laboratories.

ASCI 229. Anatomy and Physiology of Farm Animals. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 111 or BIO 161.

Comprehensive overview of the principal systems of farm animals using an integrative, systemic approach to learning the homeostasis of mammalian organisms so the information can be applied to their daily care and management. 3 lectures, 1 laboratory.

ASCI 232. General Animal Science Laboratory. 1 unit

Term Typically Offered: W

Basic handling skills of livestock; introductory selection of livestock; basic feedstuff identification and processing; and health care practices. 1 laboratory.

ASCI 260. Preparation of Livestock for Shows and Sales. 3 units

Term Typically Offered: TBD

Techniques, equipment and knowledge necessary in order to properly condition, groom, and present beef cattle or horses for evaluation and merchandising. 3 activities.

ASCI 265. Equine Behavior and Training. 3 units

Term Typically Offered: F

Training of weanling and yearling horses at halter. Selection of proper attire for the handler and equipment for the horse. Application of safe, behavioral training techniques enabling the horse to accept handling, farrier and health care. 3 activities.

ASCI 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ASCI 290. Animal Production and Management Enterprise. 1-5 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Beginning field experience in animal production systems. May include health, nutrition, reproduction, management, processing, budgeting, and/or marketing exercises. Total major credit for ASCI 290 limited to 6 units. Total credit for ASCI 290 limited to 10 units. Credit/No Credit grading only. 1-5 lectures.

ASCI 304. Animal Genomics. 3 units

Term Typically Offered: W, SP

Prerequisite: BIO 302 or BIO 303 or BIO 351.

Application of genetic principles for domestic animal improvement. Improving animal performance and health through use of genetic markers and diagnostics, gene mapping, and related current technologies. 3 lectures.

ASCI 310. Technical Veterinary Skills. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ASCI 229.

Restraint and handling of animals, physical examination, necropsy procedure, basic wound management, applied pharmacology. Reproduction and herd health programs. 3 lectures, 1 laboratory.

ASCI 311. Advanced Beef Cattle System Management. 4 units

Term Typically Offered: W

Prerequisite: ASCI 221.

Management principles for the sustainability of commercial beef cattle operations. Systems approach for goal setting, financial analysis, range management, breeding systems, nutrition, health programs, marketing, and production practices to enhance profitability of commercial cow-calf operations. 3 lectures, 1 laboratory.

ASCI 312. Production Medicine. 3 units

Term Typically Offered: SP

Prerequisite: ASCI 221 or ASCI 223; ASCI 225 or ASCI 222; ASCI 224 or ASCI 227; and ASCI 229.

Basic disease concepts. Fundamentals of immunology and therapeutics. Disease prevention principles, infectious and non-infectious. Pre-harvest food safety and milk and meat quality assurance. Herd health management programs for production efficiency and product quality. 3 lectures.

ASCI 315. Equine Biomechanics. 4 units

Term Typically Offered: F

Prerequisite: ASCI 224.

Anatomy and physiology of the equine hoof and limb. An understanding of the art and science of the farrier's work. Evaluation of proper hoof care, trimming, and shoeing. Foot and leg conformation as it relates to sound locomotion. 3 lectures, 1 activity.

ASCI 320. Physiological Chemistry of Animals. 4 units

Term Typically Offered: W, SP

Prerequisite: ASCI 229 and one of the following: CHEM 212, CHEM 216, CHEM 312, or CHEM 316.

Interactions between the biological and chemical reactions in livestock. Physiology explained at the organ, tissue and cellular level as it relates to the whole animal system. 4 lectures.

ASCI 321. Zoonoses and Veterinary Public Health Concerns. 4 units

Term Typically Offered: W

Prerequisite: BIO 111 or BIO 161.

Public health concerns including: animal and bird diseases which may be transmitted to people; pre-harvest food safety and handling concerns; and environmental public health hazards. 3 lectures, 1 activity.

ASCI 324. Advanced Equine Evaluation. 2 units

Term Typically Offered: TBD

Prerequisite: ASCI 228.

Appraising the relative merit of individual horses in halter and performance through the application, development and refinement of deductive and inductive logical processes. Oral and written expression of the selection rationale. 2 laboratories.

ASCI 325. Egg Production, Processing and Distribution. 4 units

Term Typically Offered: SP

Prerequisite: ASCI 225.

Management of replacement pullets and laying hens including flock scheduling, vaccination and handling procedures, nutrition management, costs of operation and production projections. Quality determination, processing, sales and distribution of shell eggs and egg products. 3 lectures, 1 laboratory.

ASCI 326. Advanced Livestock Evaluation. 2 units

Term Typically Offered: F

Prerequisite: ASCI 112 and ASCI 226.

Application of deductive and inductive logical processes in appraising the relative merit of individual animals within a group sample. Oral expression of the selection rationale. Total credits limited to 4 units. 2 laboratories.

ASCI 329. Principles of Range Management. 4 units

Term Typically Offered: F, SP

Prerequisite: Junior standing.

Characteristics, history and multiple uses of rangeland. Principles of range plant physiology and ecology in relation to range condition, trend, utilization and improvement practices. Principles of proper grazing practices and nutrition of livestock. 3 lectures, 1 laboratory.

ASCI 330. Poultry Meat Production and Processing. 4 units

Term Typically Offered: W

Prerequisite: ASCI 225.

Modern production techniques for the poultry meat industry. Management of hatcheries, broiler and/or turkey meat production, processing and further processing. 3 lectures, 1 laboratory.

ASCI 333. Equine Reproduction. 5 units

Term Typically Offered: W

Prerequisite: ASCI 224.

Management of the breeding farm, breeding problems, diseases, study of estrus cycles, servicing the mare, handling stallions. Breeding systems, teasing, embryo transfer, ultrasound pregnancy diagnosis, new developments in breeding technology. 4 lectures, 1 laboratory.

ASCI 339. Internship in Animal Science. 1-12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of internship instructor.

Selected Animal Science students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Major credit limited to 6 units. Total credit limited to 12 units. Credit/No Credit grading only.

ASCI 340. Animal Welfare and Ethics. 4 units

Term Typically Offered: W

Prerequisite: BIO 111 or BIO 161; and Junior Standing.

Introduction to moral principles that have shaped the field of animal welfare science. Definition of Animal Welfare. Identification of science-based measures of welfare. Current welfare concerns with companion, laboratory, production, and exotic animals. 4 lectures.

ASCI 342. Poultry Business Management. 4 units

Term Typically Offered: W

Prerequisite: ASCI 225.

Organization and management of vertically integrated poultry operations. Personnel management, cash flow analysis, cash vs. accrual accounting, structuring of financial statements, projecting product outputs and cash flow needs, employee benefit programs and insurance needs for poultry companies. 4 lectures.

ASCI 344. Equine and Human Communication. 3 units

Term Typically Offered: F, W, SP

Prerequisite: ASCI 214.

Behavior of the horse and its relationship with people. Learning, motivation, social behavior and communication with techniques to improve the safety and understanding between people and horses. Total credit limited to 6 units. 3 activities.

ASCI 345. Equine Behavior Modification. 5 units

Term Typically Offered: W

Prerequisite: ASCI 344 and consent of instructor.

Advanced principles of equine behavior modification for training young horses under saddle. Identifying differences in individual horse's attitudes, techniques to teach horses to respond to different stimuli, management of young equine athlete. 5 activities.

ASCI 346. Equine Nutrition. 4 units

Term Typically Offered: SP

Prerequisite: ASCI 220 with a grade of C- or better or consent of instructor; and ASCI 224.

Equine digestion, diet development considerations and evaluations, nutritional management, and the relationship of respective topics to recommended feeding practices, research data, and nutritional portfolios. Information is based on recent advances in horse nutrition and the National Research Council's Nutrient Requirements for Horses. 3 lectures, 1 laboratory.

ASCI 347. Equine Exercise Physiology. 3 units

Term Typically Offered: SP

Prerequisite: ASCI 224.

Applied physiology of the exercising horse. Examine different physiological systems: muscular, cardiovascular, respiratory, and nutritional. Gait analysis, lameness, and treatment. The athletic horse: sports medicine, conditioning, drugs, and necropsy evaluation. A distance learning course. 3 lectures.

ASCI 350. Nonruminant Nutrition. 4 units

Term Typically Offered: W

Prerequisite: ASCI 220 with a grade of C- or better or consent of instructor.

Comparison of nonruminant and ruminant digestive systems, nutrient requirements, risk management for ingredients, formulation and nutritional management. Influence of growth and production curves, consumption patterns, and feeding management in commercial poultry and swine industries. Feed manufacturing and governmental regulations. 3 lectures, 1 laboratory.

ASCI 351. Reproductive Physiology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ASCI 229.

Reproductive anatomy of male and female farm animals. General endocrinology and systemic physiology. Endocrine system effects on the various aspects of reproduction, such as: gametogenesis, estrus, gestation, parturition, mothering and seasonality. Introduction to reproductive biotechnology and embryo manipulation. 3 lectures, 1 laboratory.

ASCI 355. Ruminant Nutrition. 4 units

Term Typically Offered: W

Prerequisite: ASCI 220 with a grade of C- or better or consent of instructor; and ASCI 320 or CHEM 313 or CHEM 371.

Digestive physiology and nutrition of ruminants. Anatomy and physiology of the digestive tract. Rumen microbial fermentation. Nitrogen utilization and metabolism. Energy partitioning. Net energy system. Range livestock and feedlot nutrition. Supplementation. Common metabolic and nutritional dysfunctions. Diet formulation. 3 lectures, 1 laboratory.

ASCI 360. Holistic Management. 4 units

GE Area F

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and completion of GE Area B.

Application of holistic management, a goal-oriented, value-driven framework for making decisions that are ecologically, economically, and socially sound. Impact of technology and other tools on ecosystem processes. Holistic approach to management, especially of land-based resources, aimed toward greater biodiversity and sustainability. Not open to students with credit in AG 450. 3 lectures, 1 laboratory. Crosslisted as AG/ASCI 360. Fulfills GE Area F.

ASCI 363. Undergraduate Seminar. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing.

Major developments in the chosen field of the student. Discussion of new developments, policies, practices, and procedures. Each individual is responsible for the development and presentation of a topic in the chosen field, resume, and cover letter. 2 seminars.

ASCI 366. Veterinary Pharmacology. 4 units

Term Typically Offered: W

Prerequisite: CHEM 111 or CHEM 127, and ASCI 229.

Investigation of pharmacological principles applied to animal systems. Overview of drugs acting on the nervous, endocrine, circulatory, urinary systems, and reproductive systems, specialty areas of pharmacology, and pharmacogenomics of livestock and companion animals. 3 lectures, 1 activity.

ASCI 370. Rangeland Improvements. 3 units

Term Typically Offered: W

Prerequisite: ASCI 329.

Review of practices used for improving the productivity or ecological functions of rangeland landscapes managed for grazing livestock, wildlife, or for ecological and/or aesthetic values. 3 lectures.

ASCI 384. Processed Meat Products. 4 units

Term Typically Offered: F

Prerequisite: ASCI 211 and junior standing.

Physical, chemical and functional characteristics of meat food raw materials. Science and technology of value-added processing including curing, sausage manufacture, low moisture products, and restructuring. Quality assurance and related current industry topics. 3 lectures, 1 laboratory.

ASCI 400. Special Problems for Advanced Undergraduates. 1-4 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter. Credit/No Credit grading only.

ASCI 403. Applied Biotechnology in Animal Science. 5 units

Term Typically Offered: F

Prerequisite: BIO 161; BIO 162; and upper division genetics course (BIO 302 or BIO 303 or BIO 351 or ASCI 304).

Coverage of current resources, techniques and methodologies used in animal research and biotechnology as well as experimental design, model assessment, and data interpretation with application to an experimental setting in the laboratory. 3 lectures, 2 laboratories.

ASCI 405. Domestic Livestock Endocrinology. 4 units

Term Typically Offered: F

Prerequisite: ASCI 229 or BIO 361.

Endocrine homeostasis with emphasis on the influence of hormones involved in digestion, metabolism, calcium and phosphorous, thyroid gland, adrenal gland, reproduction, and pregnancy. Signaling pathways. 4 lectures.

ASCI 406. Applied Animal Embryology and Assisted Reproduction. 4 units

Term Typically Offered: F

Prerequisite: ASCI 229 and ASCI 351.

Comparative physiology and molecular understanding of oocyte development, fertilization, culturing, cryopreservation and micromanipulation of gametes and embryos. 3 lectures, 1 activity.

ASCI 407. Assisted Reproduction Technologies of Gametes and Embryos Laboratory. 3 units

Term Typically Offered: W

Prerequisite: ASCI 229; ASCI 351; and ASCI 406. Recommended: ASCI 320 or CHEM 371; CHEM 327.

Coverage of current resources, advanced techniques and methodologies of assisted reproduction of gametes and embryos involving in-vivo collection, in-vitro fertilization, cryopreservation and micromanipulation. Mouse, cattle and horse gametes used for learning the techniques involved in embryology and assisted reproduction 1 lecture, 2 laboratories.

ASCI 410. Applied Animal Behavior Science. 4 units

Term Typically Offered: SP

Prerequisite: BIO 111 or BIO 161; and ASCI 229 or BIO 162.

Principles of behavior applied to animals in managed environments. Observation and measurement of behavior, including sampling and recording methods. Learning, including training and operant conditioning. Discussion of issues related to behavioral welfare. Etiology and management of maladaptive behavior. 3 lectures, 1 laboratory.

ASCI 412. Advanced Livestock Event Planning. 3 units

Term Typically Offered: W

Prerequisite: ASCI 212, AGB 314 and consent of instructor.

Organization and planning for the Western Bonanza Junior Livestock Show. Establishment of committee assignments and show manager responsibilities. Corporate partnerships established and fund raising begun. Planning for activities and guest speakers and new student recruitment. Total credit limited to 6 units. 1 lecture, 2 activities.

ASCI 413. Advanced Livestock Event Management. 1 unit

Term Typically Offered: SP

Prerequisite: ASCI 412 and consent of instructor.

Student management of the Western Bonanza Junior Livestock Show. Leadership skills, team building, media relations, use of computer applications, livestock and fair industry contacts and mentoring to new students. Application of knowledge learned in ASCI 412. Total credit limited to 2 units. 1 activity.

ASCI 415. HACCP for Meat and Poultry Operations. 3 units

Term Typically Offered: W, SP

Prerequisite: ASCI 211.

Using Hazard Analysis and Critical Control Point (HACCP) principles to develop regulatory inspection plans for meat and poultry operations; development and use of prerequisite programs; microbiological and process overviews. 3 lectures.

ASCI 420. Animal Metabolism and Nutrition. 3 units

Term Typically Offered: TBD

Prerequisite: ASCI 220 with a grade of C- or better or consent of instructor; and ASCI 320 or CHEM 313 or CHEM 371.

Metabolism of proteins, carbohydrates, lipids, minerals, vitamins and water, and the relationship of nutrient utilization to animal production. 3 lectures.

ASCI 425. Meat Industry Study Tour. 2 units

Term Typically Offered: W

Prerequisite: ASCI 211.

Study tour of commercial meat businesses. Livestock harvest and carcass fabrication, further meat processing, retail and food service operations. Personnel, processing procedures, regulatory standards, industry specifications and current issues. Travel for 4 days. 2 activities.

ASCI 438. Systemic Animal Physiology. 4 units

Term Typically Offered: F, SP

Prerequisite: ASCI 229; CHEM 313 or CHEM 371, or ASCI 320.

Homeostatic relationships of organ systems. Cardiovascular, respiratory, urogenital and neuro-endocrinological functions. 3 lectures, 1 laboratory.

ASCI 440. Immunology and Diseases of Animals. 4 units

Term Typically Offered: SP

Prerequisite: ASCI 229. Recommended: ASCI 320, CHEM 371 or equivalent.

Introduction to immune system, including innate and acquired immunity of domesticated animals. Application of immunological analyses and examination of current disease issues in domesticated animals. 3 lectures, 1 laboratory.

ASCI 450. Computer Applications in Animal Science: Spreadsheet Analysis. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Development of spreadsheets relating to livestock production. Integration of database and analytical techniques. Cost-benefit analyses of livestock production systems. 2 lectures, 2 activities.

ASCI 455. Advanced Equine Reproductive Technologies. 4 units

Term Typically Offered: TBD

Prerequisite: ASCI 333 and ASCI 351. Recommended: ASCI 405 and ASCI 406.

Assisted reproductive technologies in horses; use of gametes from normal and sub-fertile horses; manipulation of sub-fertile horses, donor and recipient mares; manipulation of endocrine system; embryo utilization; cryobiology of gametes and embryos; assessment of high-risk mare, fetus, and neonate. 3 lectures, 1 laboratory.

ASCI 460. Rangeland Assessment and Planning. 4 units

Term Typically Offered: TBD

Prerequisite: ASCI 329.

Examination of methods used for determining the healthy and function of rangeland ecosystems, and the application of planning processes used in the management of rangelands and associated ecosystems. Field trip required. 3 lectures, 1 laboratory.

ASCI 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

ASCI 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

ASCI 477. Senior Project - Research Experience in Animal Science. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing, ASCI 363 and consent of instructor.

Recommended: one course in statistics.

Independent research experience in a specific area of animal science conducted under faculty supervision. Satisfies senior project requirement. Minimum 90 hours required.

ASCI 478. Senior Project - Advanced Internship Experience in Animal Science. 3 units

Term Typically Offered: F, W, SP

Prerequisite: ASCI 363 and senior standing.

Independent internship experience conducted under faculty supervision focusing on a discipline area of animal science. Completion of a project as a component of the internship. Satisfies senior project requirement. Minimum 90 hours required.

ASCI 479. Senior Project - Current Topics in Animal Science. 3 units

Term Typically Offered: F, SP

Prerequisite: Senior standing and ASCI 363.

Critical evaluation and formal presentation of current issues facing animal agriculture. Evaluation of current topics, analysis of supporting evidence and logic, and synthesis and formal presentation of the resulting perspectives on different approaches to current challenges. 3 lectures.

ASCI 490. Advanced Animal Production and Management Enterprise. 1-5 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Advanced field experience in animal production systems. May include health, nutrition, reproduction, management, processing, budgeting, and/or marketing exercises as well as management decision-making opportunities. Total major credit for ASCI 490 limited to 6 units. Total credit for ASCI 490 limited to 10 units. Credit/No Credit grading only. 1-5 lectures.

ASCI 500. Individual Study in Animal Science. 1-6 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

Advanced independent study planned and completed under the direction of a member of the Animal Science faculty. Total credit limited to 6 units.

ASCI 503. Advanced Molecular Techniques in Animal Science. 4 units

Term Typically Offered: TBD

Prerequisite: ASCI 403 or equivalent course.

Advanced molecular laboratory techniques in animal science. Topics include analyses of cellular and metabolic regulation, gene expression, gene activation and regulation, gene construct design, transgenesis, knockout animal models. 2 lectures, 2 laboratories.

ASCI 520. Comparative Animal Nutrition. 4 units

Term Typically Offered: TBD

Prerequisite: ASCI 320, or CHEM 313 or CHEM 371, and one of the following: ASCI 346, or ASCI 350, or ASCI 355, or DSCI 301, or consent of instructor.

Advanced problem-based presentation of animal nutrition case studies. Emphasis on nutrients, clinical nutrition disorders and species not commonly considered in production animal nutrition. Analytical and problem-solving skills will be utilized to develop solutions to complex animal nutrition management issues. 3 lectures, 1 activity.

ASCI 540. Advanced Immunology and Diseases of Animals. 4 units

Term Typically Offered: TBD

Prerequisite: ASCI 229; ASCI 320 or CHEM 371; STAT 218.

In-depth analysis of the immune system, including molecular basis for immunity of domesticated animals. Application of immunological assays, and application of scientific method to examine immunity and disease in domesticated animals. Not open to students with credit in ASCI 440. 3 lectures, 1 laboratory.

ASCI 570. Selected Topics in Animal Science. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 12 units. 1 to 4 seminars.

ASCI 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

ASCI 581. Graduate Seminar in Animal Science. 1-4 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor.

Current findings and research problems in the field and their application to the industry. Credit/No Credit grading only. Total credit limited to 12 units. 1-4 seminars.

ASCI 593. Regenerative Medicine Internship. 3-5 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in the Specialization in Regenerative Medicine for the MS in Biological Sciences; or the Specialization in Regenerative Medicine for the MS in Biomedical Engineering; or the Specialization in Animal Science for the MS in Agriculture.

Supervised graduate research and/or development in stem cell science or regenerative medicine and engineering. Provides students with an off-campus industrial or university internship. Total credit limited to 10 units. Crosslisted as ASCI/BIO/BMED 593.

ASCI 594. Applications in Regenerative Medicine. 2 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in the Specialization in Regenerative Medicine for the MS in Biological Sciences, or the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture.

Transfer of skills and knowledge gained through coursework, in an applied setting at Cal Poly. Demonstration of technical, problem solving, and presentation skills, and familiarity with current research. Part of the culminating experience for the Specialization in Regenerative Medicine in the MS in Biological Sciences, or the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture. 1 seminar and supervised work. Crosslisted as ASCI/BIO/BMED 594.

Anthropology (ANT)

ANT Courses

ANT 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

ANT 201. Cultural Anthropology. 4 units

GE Area D3

Term Typically Offered: F, W, SP

Contemporary human cultures throughout the world. General patterns sought within the diversity of individual cultures. Includes such topics as: family organization; gender roles; adaptation to the environment; systems of economic exchange; political organization and leadership; religious beliefs and values; ethnicity and cultural pluralism; impact of Western culture on the developing world. 4 lectures. Fulfills GE D3.

ANT 202. World Prehistory. 4 units

GE Area D3

Term Typically Offered: F

Development of the diverse human cultures of both the Old and New Worlds from the emergence of the first human ancestors (hominins) to the dawn of history; biological evolution, global cultural development, and adaptation before the advent of writing. 4 lectures. Fulfills GE D3.

ANT 250. Biological Anthropology. 4 units

GE Area B2

Term Typically Offered: F, W, SP

Biological aspects of human unity and diversity. Primate and human evolution, including anatomical, physiological and behavioral adaptations. Origin and diversity of modern races. 4 lectures. Fulfills GE B2.

ANT 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ANT 309. Elements of Archaeology. 4 units

Term Typically Offered: W

Prerequisite: ANT 202.

Archaeological method and theory covering the history and development of archaeological thought, approaches to data recovery, dating and analysis of artifacts and ecofacts, the construction of models of prehistoric human behavior through application of archaeological and anthropological theories. 4 lectures.

ANT 310. Archaeological Field Methods. 4 units

Term Typically Offered: TBD

Prerequisite: ANT 202 or ANT 309.

Hands-on introduction to the methods and techniques of archaeology with an emphasis on excavation. Training in artifact and ecofact identification with a focus on lithic technology. Practical field experience with hand tools, and stratigraphic interpretation. Methodological approaches to both academic research questions and compliance with environmental planning mandates. 3 lectures, 1 laboratory.

ANT 311. Archaeological Laboratory Methods. 4 units

Term Typically Offered: F

Prerequisite: ANT 309 or ANT 310.

Hands-on introduction to the methods employed in post-field processing, classification, analysis, and preservation of archaeological materials. Compilation of quantitative and qualitative information in data base format to assist in the classification and interpretation of faunal remains and artifacts. 3 lectures, 1 laboratory.

ANT 312. Introduction to Cultural Resources Management. 4 units

Term Typically Offered: SP

Prerequisite: ANT 201, ANT 202 or ANT 309.

Introduction to federal, state, and local legislation pertinent to the identification, evaluation, and treatment of cultural resources. A history of preservation legislation, culminating with detailed discussion of Section 106 of the National Historic Preservation Act and the California Environmental Quality Act. Practical experience in orienteering, map-reading, and simple cartography. 4 lectures.

ANT 320. California's Native Past. 4 units

Term Typically Offered: TBD

Prerequisite: ANT 202.

Overview of the paleoenvironment, prehistory, archaeology, and ethnography of Native California. The last 12,000 years of California's past from the arrival of the first human beings to the establishment of Spanish settlements in 1769, and the demise of native societies. 4 lectures.

ANT 325. Pre-Columbian Mesoamerica. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; one course in D2; and one course in D3.

Cultures of Mesoamerica (Mexico and Central America) from earliest times to the Spanish Conquest. Olmec, Teotihuacano, Zapotec, Maya and Aztec civilizations. Major topics include religion, politics, warfare, art, writing, calendrics, ecology and trade. 4 lectures. Fulfills GE D5 except for Anthropology/Geography and Social Sciences majors.

ANT 330. Indigenous South Americans. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and two lower-division Area D courses.

Indigenous peoples of South America from the past to the present. Cross-cultural study of small band societies, tribes and large civilization states located from the Amazon basin to the Altiplano. Comparison of current state of indigenous rights and place in modern society. 4 lectures. Fulfills GE D5 except for Anthropology/Geography and Social Sciences majors.

ANT 344. Sex, Death, and Human Nature. 4 units

GE Area D5

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; completion of GE Area D3; and completion of GE AREA B2.

How Darwinian processes of differential reproduction and mortality influence human interests, passions and behaviors. Theories of inclusive fitness, parental investment and senescence. Sex differences, sexual attraction, life histories, violence and aggression, including rape, homicide and infanticide. 4 lectures. Fulfills GE D5 except for Anthropology/Geography and Social Sciences majors.

ANT 345. Human Behavioral Ecology. 4 units

GE Area D5

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; one course in B2; and one lower-division Area D course.

Biological and cultural influences of natural and sexual selection on individual behavior. Ecological effects on human behavior to reproduce and acquire resources. Scientific method for understanding foraging behavior, group living, social skills, kinship, parenting, religion, and mating. Cross-cultural, cross-sex, and cross-species comparisons. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE D5 except for Anthropology/Geography and Social Sciences majors.

ANT 360. Human Cultural Adaptations. 4 units

GE Area D5

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; one course in D2; and one course in D3.

Social and cultural evolution from Paleolithic times to the present. Interactions of demographic, economic and ecological factors are emphasized. Main topics include human nature/culture, sex and gender, cooperation and conflict, the 'agricultural revolution', state formation, social inequality and globalization. 4 lectures. Fulfills GE D5 except for Anthropology/Geography and Social Sciences majors.

ANT 393. Action-oriented Ethnography. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; completion of GE Area D3; and one of the following: ANT 201, ANT 202, ANT 250, ISLA 123, any ES course, or any WGS course.

Development of knowledge and skills needed to conduct original action-oriented ethnographic research. Grounded in the reflexive 'turn' in anthropology and critical race, science, technology and society, queer and feminist studies, students will engage questions of authority, representation, critical consciousness and justice. 4 lectures. Crosslisted as ANT/ISLA 393.

ANT 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

ANT 401. Culture and Health. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing, ANT 201, and one of the following: ANT 250, BIO 160, or BIO 263; or graduate standing.

Global perspective on the relationship between culture and health. Ecological factors influencing health and illness. Origins of disease and impact of diseases on society. Diet and nutrition. Classifications of illness causation. Kinds of curers. Relationship of gender and reproduction to illness. Pharmacology. Mental illness. Global health problems. Alternative health care modalities. Health-care needs of U.S. ethnic groups. 4 lectures.

ANT 402. Nutritional Anthropology. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and ANT 201. Recommended: ANT 250.

Interrelationships of sociocultural and ecological factors and their influence on nutrition and human health in developing and developed country contexts. Topics include human adaptation, nutritional assessment, food production and allocation, the effect of development on diet and health. 4 lectures.

ANT 415. Native American Cultures. 4 units

USCP

Term Typically Offered: W

Prerequisite: One upper division ANT course.

Survey of Native American cultures from earliest times to present, emphasizing regional diversity in traditional lifeways. Origins of New World peoples, domestication, war, social organization, trade and gender roles. 4 lectures. Fulfills USCP.

ANT 425. Meaning, Gender, and Identity in Anthropological Theory. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area D3. Recommended: ANT 201.

Exploration of the intersection of anthropological theory with meaning, gender/sexuality, and identity formations within and between cultural contexts. Situate and analyze anthropological discourses regarding social meanings and cultural identities as defined by oppositions of us and other, male and female, normal and abnormal, natural and unnatural. Provide a potential source of comparative cultural reflection and critique. 4 lectures.

ANT 455. Anthropology-Geography Research Design and Methods. 4 units

Term Typically Offered: F, W

Prerequisite: Completion of one GE B2 and two upper division ANT or GEOG classes.

Development of knowledge and skills needed to conduct original scientific anthropology-geography research and prepares students for senior projects. Various empirical methodologies highlighted, with a focus on quantitative design and measurement of human culture, biology, behavior, environment and ecology. 3 lectures, 1 laboratory. Crosslisted as ANT/GEOG 455.

ANT 460. Queer Anthropology. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; GE Area D3; and one of the following: ANT 201, ISLA 123, any course in Ethnic Studies, or any course in Women's and Gender Studies.

Exploration of intersections of queer identities and politics of race, gender, kinship, the body, class, and desire. Evaluation of how anthropology has been transformed by queer critique and knowledge production. Investigation of the multi-scaled fields of power that articulate a cultural understanding of the body. 4 lectures.

ANT 461. Senior Project I. 2 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

ANT 462. Senior Project II. 2 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

ANT 464. Professional Preparation for Anthropologists/Geographers. 1 unit

CR/NC

Term Typically Offered: F

Prerequisite: Junior standing, ANT 201, GEOG 150.

Preparation for professional advancement in the fields of anthropology and geography. Supervised career planning emphasizing resume development, selection of an internship or international experience, exploration of career options and graduate programs. Lectures from outside, practicing professionals. Credit/No Credit grading only. 1 seminar.

ANT 465. Internship. 3-8 units

CR/NC

Term Typically Offered: TBD

Prerequisite: ANT 464, senior standing and/or consent of instructor.

Supervised training, research, and work in public and private organizations. Credit/No Credit grading only. Total credit limited to 18 units.

ANT 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

Architectural Engineering (ARCE)

ARCE Courses

ARCE 106. Introduction to Building Systems. 2 units

Term Typically Offered: F

Introduction to building systems and materials. Use and application of structural, foundation, envelope, mechanical and electrical systems in the field of Architectural Engineering. 1 lecture, 1 activity.

ARCE 211. Structures I. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: For ARCE majors: PHYS 141, MATH 142; for ARCH and CM majors: PHYS 121 or PHYS 141, MATH 142 or MATH 182.

Introduction to the role of structures in the making of buildings. Introduction to statics and creation of simple three-dimensional structures. Development of skills to analyze structures composed of axial force (truss) members. 2 lectures, 1 activity.

ARCE 212. Structures II. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: ARCE 211 (C- or better required for ARCE Majors).

Introduction to the role of structures in the making of buildings. Introduction to shear and moment diagrams using the principles of statics and the application of the diagrams to simple three-dimensional structures. Development of skills, particularly free body diagrams, to analyze structures composed of bending (beams) members. 3 lectures.

ARCE 223. Mechanics of Structural Members. 3 units

Term Typically Offered: F, SP

Prerequisite: ARCE 212 (C- or better required for ARCE Majors).

Concurrent for ARCE majors: ARCE 224.

Advanced topics of stresses in beams. Plastic bending, unsymmetrical bending. Combined stresses. Stress transformation. Buckling. Deflection of beams. 3 lectures.

ARCE 224. Mechanics of Structural Members Laboratory. 1 unit

Term Typically Offered: F, SP

Concurrent: ARCE 223.

Experimental investigations of material properties. Experimental studies of stresses and deflections in beams, including plastic bending, and unsymmetrical bending. Stress transformations via strain gages for combined loading cases. Culminating lab experience: A student run, self-designed experiment. 1 laboratory.

ARCE 226. Introduction to Structural Systems. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: ARCE 212.

Description, behavior and comparison of structural building systems. Concepts of structural stability, load flow, framing schemes and building configuration related to vertical and lateral loads. Not open to Architectural Engineering majors. 3 lectures.

ARCE 227. Structures III. 2 units

Term Typically Offered: F, SP

Prerequisite: ARCE 212 (C- or better required for ARCE Majors).

Continuation of selected concepts covered in ARCE 211 and ARCE 212. Advanced topics in two-dimensional and three-dimensional equilibrium of structural building systems. 2 lectures.

ARCE 257. Structural CAD for Building Design. 2 units

Term Typically Offered: W, SP

Prerequisite: ARCH 133, CM 115.

Emphasis on the use of computer graphics software to represent a building's structural system and its individual elements. 1 lecture, 1 laboratory.

ARCE 260. History of Structures. 4 units

GE Area C3

Term Typically Offered: TBD

Social, symbolic, and technical importance of landmark structures. Analysis of breakthrough ideas that led to major advances in building design. Contextualization of these advances. Tools by which to assess and critique structural art as a separate and distinct art form. 4 lectures. Fulfills GE C3.

ARCE 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ARCE 302. Structural Analysis. 3 units

Term Typically Offered: F, W

Prerequisite: ARCE 223 and ARCE 227 (C- or better required for ARCE Majors). Concurrent for ARCE majors: ARCE 352.

Analysis of statically indeterminate structures using virtual work, slope deflection, the force method and moment distribution. Analysis of structural systems using approximate methods and influence lines. 3 lectures.

ARCE 303. Steel Design I. 3 units

Term Typically Offered: W, SP

Prerequisite: ARCE 223 (C- or better required for ARCE Majors). Corequisite for ARCE majors: ARCE 371. Corequisite for ARCE minors: ARCE 226.

Analysis and design of steel structural members subjected to bending, shear and axial forces. 3 lectures.

ARCE 304. Timber Design. 3 units

Term Typically Offered: W, SP

Prerequisite: ARCE 371 for ARCE majors (with C- or better); ARCE 223 and ARCE 226 for ARCE minors.

Analysis and design of timber structural members subjected to bending, shear, and axial forces. Wood diaphragms, shear walls and their connections. 3 lectures.

ARCE 305. Masonry Design. 2 units

Term Typically Offered: W, SP

Prerequisite: ARCE 371 for ARCE majors (with C- or better); ARCE 223 and ARCE 226 for ARCE minors.

Design of load-bearing walls, shear walls, columns and beams in masonry. 2 lectures.

ARCE 306. Matrix Analysis of Structures. 3 units

Term Typically Offered: F, W

Prerequisite: ARCE 302 (C- or better required for ARCE Majors). Concurrent: ARCE 353.

Analysis of statically indeterminate structures by direct stiffness method including continuous beams, plane trusses, and frames. Introduction to finite-element methods. 3 lectures.

ARCE 315. Introduction to Structural Design. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: ARCE 226.

Introduction to structures that use timber, steel and concrete as the primary construction material. Introduction to gravity load carrying systems and lateral load resisting systems using timber, steel and concrete elements. Credit not allowed for ARCE majors. 4 lectures.

ARCE 316. Structural Integration in Architecture. 4 units

Term Typically Offered: SP

Prerequisite: ARCE 315. Concurrent: ARCH 353.

Integration of structural systems into architectural design. Preliminary design of structures including the development of gravity load carrying systems and lateral load resisting systems. Introduction to tall building and long span structural systems. Introduction to structural issues of cladding systems. Not open for major credit to Architectural Engineering majors. 4 lectures.

ARCE 352. Structural Computing Analysis. 1 unit

Term Typically Offered: F, W

Prerequisite: CSC 231 or CSC 234. Concurrent: ARCE 302.

Computer calculations, programming and technical reporting. Emphasis on use of two-dimensional structural analysis software to analyze a building's structural system and its individual elements. 1 laboratory.

ARCE 353. Matrix Structural Computing Analysis. 1 unit

Term Typically Offered: F, W

Prerequisite: ARCE 352 (C- or better required for ARCE Majors). Concurrent: ARCE 306.

Emphasis on the use of nonplanar structural analysis software to analyze a building's structural system and its individual elements. 1 laboratory.

ARCE 354. Numerical Analysis Laboratory. 1 unit

Term Typically Offered: W, SP

Prerequisite: MATH 244 and ARCE 353 (C- or better required for ARCE Majors). Concurrent: ARCE 412.

An intensive survey of numerical analysis techniques used for solving engineering problems. Topics include integration, ordinary differential equations, and the eigenproblem. 1 laboratory.

ARCE 371. Structural Systems Laboratory. 3 units

Term Typically Offered: F, W

Prerequisite: ARCE 223, ARCE 227 (C- or better required for ARCE Majors), and third year standing in Architectural Engineering. Corequisite: ARCE 302.

Studies in the relationship of structural framing to overall building geometry. Emphasis on the stability of structural configurations, calculation of building loads and development of a complete gravity and lateral load path. 3 laboratories.

ARCE 372. Steel Structures Design Laboratory. 3 units

Term Typically Offered: F, SP

Prerequisite: ARCE 257, ARCE 302, ARCE 303, ARCE 352 and ARCE 371 (C- or better required for ARCE Majors).

Steel framed project incorporating structural system configuration and selection, structural analysis for gravity and lateral loads, and construction drawings and specifications. Integration of building services and architectural design, constructability issues, and relationships between construction methods and cost. 3 laboratories. Cannot be taken concurrently with ARCE 451 or ARCE 452.

ARCE 400. Special Problems for Advanced Undergraduates. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor and department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter.

ARCE 403. Advanced Steel Structures Laboratory. 3 units

Term Typically Offered: TBD

Prerequisite: ARCE 372 (C- or better required for ARCE Majors).

Advanced topics in design and construction of steel structures, such as: plate girders, plastic design of beams and frames, and composite beam design, load and resistance factor design, and advanced topics related to moment frames and braced frames. 3 laboratories.

ARCE 410. Integrated Building Envelopes. 4 units

Term Typically Offered: TBD

Prerequisite: Fourth year standing. Recommended: Third year design and analysis courses; ARCE 302, ARCE 372.

Multidisciplinary exploration of the value and collaboration required of an integrated project team approach to the design and construction of sophisticated building envelopes. Team taught by instructors and practitioners from each of the following disciplines: architecture, architectural engineering and construction management. 4 lectures.

ARCE 412. Dynamics of Framed Structures. 3 units

Term Typically Offered: W, SP

Prerequisite: ME 212; MATH 244; and ARCE 306 (C- or better required for ARCE Majors). Concurrent: ARCE 354.

Analysis of structures subjected to dynamic loads with single- and multi-degrees of freedom. Development of techniques for analysis of structures in response to time varying loads. 3 lectures.

ARCE 415. Interdisciplinary Capstone Project. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ARCE 303, ARCE 304, ARCE 305, ARCE 444, ARCE 372 or ARCE 451 (C- or better required for ARCE Majors).

Team based interdisciplinary capstone / senior project course. Analysis and evaluation of interdisciplinary challenges associated with integrating the design and construction processes to deliver a project with respect to the design, budget, schedule, quality, and performance expectations of a client. 4 laboratories.

ARCE 421. Soil Mechanics. 3 units

Term Typically Offered: F, W, SP

Prerequisite: ARCE 212 (C- or better required for ARCE Majors); GEOL 201.

Principles of soil mechanics, including rudiments of geology, soil classification, gravimetric and volumetric relations, compaction, methods and testing, shear strength of soil and strength theories. 2 lectures, 1 laboratory.

ARCE 422. Foundation Design. 3 units

Term Typically Offered: W, SP

Prerequisite: ARCE 421 (C- or better required for ARCE Majors).

Soil-bearing capacity; sizing and design of spread footings. Design and analysis of earth-retaining structures. Analysis of the stability of slopes. 3 lectures.

ARCE 423. Advanced Foundation Design. 3 units

Term Typically Offered: TBD

Prerequisite: ARCE 422 and ARCE 444 (C- or better required for ARCE Majors).

Design, analysis, and construction issues related to shallow and deep foundation systems, mat foundations, retaining walls, and grade beams. Studies investigation the impact of sub-grade structural systems on building behavior and cost. 3 laboratories.

ARCE 444. Reinforced Concrete Design. 4 units

Term Typically Offered: F, W

Prerequisite: ARCE 371 and ARCE 302 (C- or better required for ARCE Majors).

Theory and design of basic reinforced concrete elements: non-slender columns, beams, tee beams and one way slabs. 3 lectures, 1 laboratory.

ARCE 445. Prestressed Concrete Design Laboratory. 3 units

Term Typically Offered: TBD

Prerequisite: ARCE 444 (C- or better required for ARCE Majors).

Design and analysis of prestressed concrete structures. 3 laboratories.

ARCE 446. Advanced Structural Systems Laboratory. 3 units

Term Typically Offered: TBD

Prerequisite: ARCE 226 or ARCE 371 (C- or better required for ARCE Majors).

Concepts and issues involved in the design of complex structures including tall buildings, shells, arches and tension structures. 3 laboratories.

ARCE 447. Advanced Reinforced Concrete Laboratory. 3 units

Term Typically Offered: TBD

Prerequisite: ARCE 444 (C- or better required for ARCE Majors).

Advanced topics in the design of reinforced concrete structures with emphasis on isolated and combined foundations, retaining walls, seismic-resistant ductile frames and yield line theory. 3 laboratories.

ARCE 448. Seismic Rehabilitation. 3 units

Term Typically Offered: TBD

Prerequisite: ARCE 303, ARCE 304, ARCE 305, ARCE 412, ARCE 444 (C- or better required for ARCE Majors).

Overview of the general rehabilitation process and philosophy. Evaluation and analysis of existing structures to determine expected performance due to seismic loads. Development of basic rehabilitation strategies for buildings. 2 lectures, 1 laboratory.

ARCE 449. Cold Formed Steel Design Laboratory. 3 units

Term Typically Offered: TBD

Prerequisite: ARCE 303 and ARCE 451 (C- or better required for ARCE Majors).

Analysis and design of cold formed steel structural members subjected to bending, shear, and axial forces. Project based design and constructability of cold formed structural systems including gravity framing, diaphragms, shear walls and their connections. 3 laboratories.

ARCE 451. Timber and Masonry Structures Design and Constructability Laboratory. 3 units

Term Typically Offered: F, SP

Prerequisite: ARCE 257, ARCE 304, ARCE 305, and ARCE 371 (C- or better required for ARCE Majors).

Timber and masonry framed project incorporating structural system configuration and selection, structural analysis for gravity and lateral loads, and construction drawings and specifications. Integration of building services and architectural design, constructability issues, and relationships between construction methods and cost. 3 laboratories. Cannot be taken concurrently with ARCE 372 or ARCE 452.

ARCE 452. Concrete Structures Design and Constructability Laboratory. 3 units

Term Typically Offered: W, SP

Prerequisite: ARCE 257, ARCE 444, and ARCE 372 or ARCE 451 (C- or better required for ARCE Majors).

Cast in place concrete framed project incorporating structural system configuration and selection, structural analysis for gravity and lateral loads, and construction drawings and specifications. Integration of building services and architectural design, constructability issues, and relationships between construction methods and cost. 3 laboratories. Cannot be taken concurrently with ARCE 372 or ARCE 451.

ARCE 453. Interdisciplinary Senior Project. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: ARCE 372, ARCE 451, ARCE 452, ARCE 483 (C- or better required for ARCE Majors).

Interdisciplinary projects by interdisciplinary teams under faculty supervision that go beyond topics covered in the Architectural Engineering curriculum. Projects must include integration with other disciplines outside of structural or architectural engineering. Total credit limited to 4 units.

ARCE 460. Collaborative Design Laboratory. 2 units

Term Typically Offered: F, W, SP

Prerequisite: ARCE 372 or ARCE 451 (C- or better required for ARCE Majors).

Investigation of the collaborative nature of the design process as it relates to the architectural engineer and related disciplines. Development of skills necessary to create a successful design team through the development of specific projects. Total credit limited to 4 units. 2 laboratories.

ARCE 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 lectures.

ARCE 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

ARCE 473. Advanced Timber and Masonry Structures Laboratory. 3 units

Term Typically Offered: TBD

Prerequisite: ARCE 372, ARCE 422, ARCE 444 and ARCE 451 (C- or better required for ARCE Majors).

Emphasis on long span industrial/warehouse type buildings. Use of steel in timber/masonry construction and constructability. Holes in diaphragms, out-of-plane wall behavior and sub-diaphragms, perforated wood and masonry shear walls, pre-manufactured shear walls, masonry retaining walls, connections including post-installed anchors. 3 laboratories.

ARCE 475. Civil Infrastructure and Building Systems. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing in CE or ARCE.

Principles and practices for the sustainable design, fabrication, and installation of systems for the civil infrastructure and building; including structural, air/gas, water/wastewater, electrical, and control systems. Methods and materials used for fabrication and installation; including cost and schedule considerations. 4 lectures. Crosslisted as ARCE/CE 475.

ARCE 476. Architectural Engineering Building Systems. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing in ARCE.

Principles and practices for the sustainable design, fabrication, and installation of architectural engineering building systems; including air/gas, water/waste water, electrical, and control systems. Methods and materials used for fabrication and installation; including cost and schedule considerations. 3 lectures. Not open to students with credit in ARCE/CE 475.

ARCE 483. Seismic Analysis and Design. 3 units

Term Typically Offered: F, SP

Prerequisite: ARCE 372, ARCE 412 (C- or better required for ARCE Majors).

Introduction to dynamic response analysis of building structures with emphasis on earthquake ground motion. Earthquake resistant design of buildings in accordance with building codes. Application of computer programs and physical models for seismic design. Laboratory studies utilizing physical models for studying the behavior of building structures subjected to simulated ground motions. 2 lectures, 1 activity.

ARCE 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of department head.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 12 units. Credit/No Credit grading only. Credits to not count toward graduation in the ARCE Degree Program.

ARCE 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 24 units. Credit/No Credit grading only. Credits to not count toward graduation in the ARCE Degree Program.

ARCE 501. Advanced Structural Mechanics. 3 units

Term Typically Offered: F

Prerequisite: ARCE 306, ARCE 353.

Principles, concepts, and techniques of advanced structural mechanics. Studies of displacement, strain, stress, strain-displacement relation and constitutive models in three dimensions. Failure criteria. Introduction into energy principles and approximate solutions. 3 lectures.

ARCE 502. Nonlinear Structural Behavior I. 3 units

Term Typically Offered: F

Prerequisite: ARCE 306 and ARCE 353.

Principles, concepts, and behavior of structures loaded beyond their linear-elastic limit. Elastic-plastic behavior of truss, beam, and frame structures. Buckling and post-buckling behavior of columns. Behavior of beam-columns and the principle of superposition. Second-order elastic behavior of frames. 3 lectures.

ARCE 503. Nonlinear Structural Behavior II. 3 units

Term Typically Offered: W

Prerequisite: ARCE 502.

Principles, concepts, and techniques of nonlinear structural analysis currently used in practice. Classification of nonlinear problem types. Investigation of typical iterative solution strategies. Studies in material and geometric nonlinearities in spring, truss, and frame elements. Use of current nonlinear analysis software. 3 lectures.

ARCE 504. Finite Element Method for Building Structures. 3 units

Term Typically Offered: W

Prerequisite: MATH 244, ARCE 306, ARCE 501.

Basic concepts of equilibrium and compatibility. Stiffness and flexibility properties of various types of finite elements. Development and application of displacement and force methods. Elastic stability and dynamic response of buildings to earthquake, wind, and moving loads. Use of finite-element computer programs. 3 seminars.

ARCE 511. Structural Systems Behavior. 3 units

Term Typically Offered: SP

Prerequisite: ARCE 371, ARCE 403, ARCE 452, ARCE 483.

Design, performance, and construction issues related to structural systems. Further development of design and analysis techniques necessary for performance based engineering of structural systems. Assessment of advantages and limitations of different structural forms and systems. 3 laboratories.

ARCE 521. Architectural Structures. 3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in Architecture.

Static and dynamic loads, structural equilibrium and stability, structural configurations and systems, response to dynamic loads, behavior of structures. 2 seminars, 1 activity.

ARCE 522. Structural Systems. 3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in Architecture.

Exploration of the relationship between structural systems and architectural form. Understanding of structural stability and structural order is developed through construction of a series of small scale models. Historical perspectives are presented along with the effects of available materials and technology on structural possibilities. 3 seminars.

ARCE 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

ARCE 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

ARCE 598. Structural Engineering Design Project. 3 units

Term Typically Offered: F, W, SP

Prerequisite: ARCE 371, ARCE 403, ARCE 452, ARCE 483.

Independent development, research, and conclusion of a graduate project by individuals or teams specializing in the area of architectural or structural engineering. Projects may include graduate students from other disciplines. Students shall enroll in 3 quarters. Total credit limited to 9 units. 3 laboratories.

Architecture (ARCH)

ARCH Courses

ARCH 101. Survey of Architectural Education and Practice. 1 unit CR/NC

Term Typically Offered: F, W, SP

Exploration of the major paradigms which have guided the development of architectural education and the profession. Survey of the roles of the architects and an introduction to curricula and programs designed to prepare students for careers in architecture. Credit/No Credit grading only. 1 lecture. Total credit limited to 3 units.

ARCH 106. Materials of Construction. 2 units

Term Typically Offered: TBD

Use and application of construction processes and materials. 2 lectures.

ARCH 131. Design and Visual Communication 1.1. 4 units

Term Typically Offered: F

Prerequisite: Architecture or Architectural Engineering majors only.

An introduction to the issues, concepts, processes and skills pertaining to two- and three-dimensional design and the freehand, constructed and digital representation and visual communication of ideas, objects and environments. Purchase of a laptop computer, software and peripherals is highly recommended to participate in this course. 4 laboratories.

ARCH 132. Design and Visual Communication 1.2. 4 units

Term Typically Offered: W

Prerequisite: ARCH 131.

Continuation of ARCH 131 plus the issues, concepts, processes and skills pertaining to color theory and the design and visual communication of architectural space. Purchase of a laptop computer, software and peripherals is highly recommended to participate in this course. 4 laboratories.

ARCH 133. Design and Visual Communication 1.3. 4 units

Term Typically Offered: SP

Prerequisite: ARCH 132.

Continuation of ARCH 131 and ARCH 132 plus the issues, concepts, processes and skills pertaining to the analysis and design of architectural form, space and organizations. Purchase of a laptop computer, software and peripherals is highly recommended to participate in this course. 4 laboratories.

ARCH 204. Architectural Theory. 3 units

Term Typically Offered: TBD

Prerequisite: EDES 101 or EDES 123.

Theories of architectural design. 3 lectures.

ARCH 207. Architectural Technology Fundamentals 2.3. 4 units

Term Typically Offered: SP

Prerequisite: ARCH 242. Concurrent: ARCH 253.

Theory and application of climate, energy use and comfort as determinants of architectural form in small-scale buildings. Emphasis on architectural methods of ventilating, cooling, heating, and lighting for envelope-load dominated buildings. 2 lectures, 2 activities.

ARCH 217. History of World Architecture: Prehistory - Middle Ages. 4 units

GE Area C3

Term Typically Offered: F

Architecture and urbanism in the ancient world, from prehistory to the Middle Ages. Social, cultural and physical conditions that influenced the built environment to the Mediterranean basis, plus Europe, Asia, Africa and Pre-Columbian America. 4 lectures. Fulfills GE C3.

ARCH 218. History of World Architecture: Middle Ages - 18th Century. 4 units

GE Area C3

Term Typically Offered: W

World architecture and urbanism from the Middle Ages until the end of the 18th century Baroque. Social, cultural and physical conditions which influenced the built environment of Europe, Asia, and the Pre-Columbian and Colonial Americas. 4 lectures. Fulfills GE C3.

ARCH 219. History of World Architecture: 18th Century - Present. 4 units

GE Area C3

Term Typically Offered: SP, SU

Architecture and urbanism of the modern world, from the 18th century to the present. Social, cultural and physical conditions influencing the built environment of Europe, Asia, Africa and the Americas. 4 lectures. Fulfills GE C3.

ARCH 241. Architectural Technology Fundamentals 2.1. 4 units

Term Typically Offered: F

Prerequisite: ARCH 133. Corequisite: ARCH 251.

The language, principles and materials of construction with an emphasis on the origin, history, and application of traditional and emergent materials. 2 lectures, 2 activities.

ARCH 242. Architectural Technology Fundamentals 2.2. 4 units

Term Typically Offered: W

Prerequisite: ARCH 241. Corequisite: ARCH 252.

A continuation of ARCH 241 with an emphasis on the fundamental aspects of construction systems and the basics of construction documentation. 2 lectures, 2 activities.

ARCH 251. Architectural Design 2.1. 5 units

Term Typically Offered: F

Prerequisite: ARCH 133. Corequisite: ARCH 241.

Continuation of ARCH 133 in terms of materiality and the theories, concepts, processes and skills pertaining to the analysis and design of architectural form, space and organizations to communicate intended concepts and meanings. 5 laboratories.

ARCH 252. Architectural Design 2.2. 5 units

Term Typically Offered: W

Prerequisite: ARCH 251, ARCH 241. Corequisite: ARCH 242.

Continuation of ARCH 251 plus the theories, concepts, processes and skills pertaining to light, construction and function as determinants that shape the built environment and support the communication of intended concepts and meanings. 5 laboratories.

ARCH 253. Architectural Design 2.3. 5 units

Term Typically Offered: SP

Prerequisite: ARCH 252 and ARCH 242. Corequisite: ARCH 207.

Continuation of ARCH 251 and ARCH 252 plus the theories, concepts, processes and skills pertaining to context, structure and climate as determinants that shape the built environment and support the communication of intended concepts and meanings. 5 laboratories.

ARCH 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Directed group study of selected topics. The Schedule of Classes will list title selected. Open to first-, second-, third-year students. Total credit limited to 8 units. 1 to 4 lectures.

ARCH 302. Theories of Architectural Design. 3 units

Term Typically Offered: TBD

Prerequisite: ARCH 253.

Theories of architecture and their application in architectural design. 3 lectures.

ARCH 307. Architectural Systems Integration 3.2. 4 units

Term Typically Offered: W

Prerequisite: ARCH 341. Concurrent: ARCH 352.

Continuation of ARCH 341 plus theory and application of climate, energy use and comfort as determinants of architectural form in large-scale buildings. Emphasis on architectural and mechanical methods of ventilating, cooling, heating, lighting, acoustics, and water and waste systems for internal-load dominated buildings. 2 lectures, 2 discussions.

ARCH 313. Advanced Delineation. 2 units

Term Typically Offered: SP

Prerequisite: ARCH 253.

Development of proficiency in architectural presentation. Projects and critiques. 2 laboratories.

ARCH 320. Topics in Architectural History. 4 units

GE Area C4

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A1 with a grade of C- or better; and one of the following GE Area C3 courses: ARCH 217, 218, 219, or ART 112.

In-depth examination of a significant region, movement or period in architectural history, theory and criticism. The material covered will vary depending upon the topic. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Fulfills GE C4 except for Architecture majors.

ARCH 326. Native American Architecture and Place. 4 units

GE Area C4; USCP

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

The role of culture and setting in the construction of spatial, material and landscape concepts and artifacts, through the introduction of selected North American cultures, with focus from 1300 AD through contemporary time. 4 lectures. Crosslisted as ARCH/ES 326. Fulfills GE C4. Fulfills USCP.

ARCH 341. Architectural Systems Integration 3.1. 4 units

Term Typically Offered: F

Prerequisite: ARCH 207 and ARCH 253. Corequisite: ARCH 351.

Continuation of ARCH 207 plus the concepts, methods and processes and building systems that pertain to the detailing and construction of large-scale masonry, steel, concrete and combination structures. 2 lectures, 2 discussions.

ARCH 342. Architectural Systems Integration 3.3. 4 units

Term Typically Offered: SP

Prerequisite: ARCH 307. Concurrent: ARCH 353.

Continuation of ARCH 307 plus the concepts, methods, and processes pertaining to the preparation of outline specifications, production of design development drawings, life safety, building systems integration and building envelope and fabrication systems that inform the design and development of large scale buildings. 2 lectures, 2 discussions.

ARCH 351. Architectural Design 3.1. 5 units

Term Typically Offered: F

Prerequisite: ARCE 212, ARCH 253, ARCH 207 and PHYS 122 or PHYS 132, or consent of department head. Corequisite: ARCH 341.

Continuation of ARCH 253 plus the development and exploration of architectural theories, building systems, and design concepts and processes involved in creating architecture with an emphasis on implications of the program and space planning issues as building form generator. 1 lecture, 4 laboratories.

ARCH 352. Architectural Design 3.2. 5 units

Term Typically Offered: W

Prerequisite: ARCH 351, ARCH 341. Corequisite: ARCH 307.

Continuation of ARCH 351 plus the development and exploration of architectural theories, building systems, and design concepts and processes involved in creating sustainable architecture with an emphasis on implications of ecological, environmental and site issues as building form generator. 1 lecture, 4 laboratories.

ARCH 353. Architectural Design 3.3. 5 units

Term Typically Offered: SP

Prerequisite: ARCH 352, ARCH 307. Corequisite: ARCH 342.

Continuation of ARCH 352 plus the development and exploration of architectural theories, building systems, and design concepts and processes involved in creating large-scale architecture with an emphasis on implications of socio-cultural and comprehensive/life safety systems integration issues as building form generator. 1 lecture, 4 laboratories.

ARCH 363. Off-Campus Orientation Seminar. 2 units

CR/NC

Term Typically Offered: SP

Prerequisite: Consent of instructor.

Preparation for off-campus architectural study programs includes cultural orientation, an introduction to basic language skills, travel and housing protocols as well as academic and financial advising. Credit/No Credit grading only. Total credit limited to 4 units, with a maximum of 2 units per quarter. 2 seminars.

ARCH 400. Special Problems for Advanced Undergraduates. 1-2 units
CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading only.

ARCH 420. Seminar in Architectural History, Theory and Criticism. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ARCH 217, ARCH 218, and ARCH 219.

Special topics based on the exploration of specific approaches, periods of time, and cultural or geographic areas. The Schedule of Classes will list topic selected. Total credit limited to 12 units; repeatable in same term. 4 seminars.

ARCH 443. Issues in Contemporary Professional Practice. 4 units

Term Typically Offered: W

Prerequisite: ARCH 342, ARCH 353.

An exploration of topics related to the practice of architecture, including financial considerations, client obligations, project and practice management, leadership, legal responsibilities, ethics and professional judgment, and community and social responsibility, as well as the process and requirements for internship and licensure. 2 lectures, 2 discussions.

ARCH 445. Urban Design in Architecture. 3 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A1 with a grade of C- or better.

Design role of the urban architect. Economic, environmental and technological forces impacting on architectural practice in urban areas. 3 lectures.

ARCH 451. Architectural Design 4.1. 5 units

Term Typically Offered: F

Prerequisite: ARCE 316, ARCH 353, ARCH 342.

Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multifunction singular buildings. 5 laboratories.

ARCH 452. Architectural Design 4.2. 5 units

Term Typically Offered: W

Prerequisite: ARCE 316, ARCH 353, ARCH 342.

Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multibuilding, multifunctional projects. 5 laboratories.

ARCH 453. Architectural Design 4.3. 5 units

Term Typically Offered: SP

Prerequisite: ARCE 316, ARCH 353, ARCH 342.

Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multifunctional projects in an urban context. Total credit limited to 10 units and may substitute for ARCH 451 or ARCH 452. 5 laboratories.

ARCH 460. Computer Graphics Applications III. 3 units

Term Typically Offered: TBD

Prerequisite: ARCH 133 or ARCH 160 or consent of instructor.

Advanced methods in the application of computer graphics and multimedia techniques in architectural design. 2 lectures, 1 activity.

ARCH 461. Advanced Computer-Aided Fabrication in Architecture. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Applications of computer-aided manufacturing in architectural design with emphasis on subtractive and additive fabrication methods, material assemblies, and advanced techniques in digital design software. 2 lectures, 2 activities.

ARCH 462. Topics in Architectural Practice. 3-4 units

Term Typically Offered: W

Prerequisite: ARCH 342.

Selected topics addressing various aspects of Architectural Practice for advanced students in CAED. Topics may include strategic planning, managing quality, ethics, and legal considerations. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 8 units; repeatable in same term. 3-4 lectures.

ARCH 464. Computer Applications in Design. 3 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Exposure to aspects of computer-aided design. Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures.

ARCH 465. Design Related Media. 3 units

Term Typically Offered: TBD

Prerequisite: Junior standing and current participation in Washington Alexandria Architectural Consortium off-campus program.

The role of various media of visual communication as tools of documentation, analysis and creation in the design visual environment. Skills in graphics, photography, product design, film, video techniques, and printmaking graphics will be developed in specific relation to environmental design study and presentation. Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures.

ARCH 466. Topics in Architectural History and Theory. 3 units

Term Typically Offered: TBD

Prerequisite: Junior standing and current participation in Washington Alexandria Architectural Consortium off-campus program.

Design from its beginning with the crafts design period to its expression of industrial design in its present form. Various stages in the evolution of design explored through analyzing the influences and contributions of leading artists. Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures.

ARCH 467. Undergraduate Research. 3 units

Term Typically Offered: TBD

Prerequisite: Junior standing and current participation in Washington Alexandria Architectural Consortium off-campus program.

Architecture and urban theoretical intentions and results in the context of the Capitol of the United States - Washington, DC. This theoretical and historical study will not occur within the confines of the classroom, but directly within the 'laboratory' of the city. Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures.

ARCH 468. Advanced Environmental Building Systems. 3 units

Term Typically Offered: TBD

Prerequisite: Junior standing and current participation in Washington Alexandria Consortium off-campus program.

Technologies which provide a 'well building' environment by engaging in: weather protection; thermal/moisture control; natural and artificial lighting; and electrical and other 'energy source' utility service. 3 lectures.

ARCH 469. Topics in Design Methods. 3 units

Term Typically Offered: TBD

Prerequisite: Junior standing and current participation in the Washington Alexandria Architectural Consortium off-campus program.

Relationship of art and architecture addressed to encourage critical debate. Historically, the 'art' and the 'architecture' were not as polarized as today. Both historical perspective and practical issues concerning collaboration. Class Schedule will list topic selected. Total credit limited to 12 units. 3 lectures.

ARCH 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 16 units. 1 to 4 lectures.

ARCH 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

ARCH 472. Housing Design Concepts. 3-4 units

Term Typically Offered: TBD

Prerequisite: Third-year standing.

For students preparing for further study or practice relating to housing, urban design and new communities. This course will address design objectives, concepts, and current theories and forms in housing and mixed-use projects. 3-4 lectures.

ARCH 473. Material Innovation Lab. 4 units

Term Typically Offered: F, SP

Prerequisite: ARCH 461.

Applied research through the design and fabrication of full-scale building assemblies, using computer-aided manufacturing. Material properties, methods of manufacturing, and building performance. Total credit limited to 12 units. 2 lectures, 2 activities.

ARCH 480. Special Studies in Architecture. 1-12 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing.

Special issues and problems through research, field trips, design projects, and other forms of investigation and involvement. Course requirements are determined prior to each individual project through a contractual agreement between students and department. The departmental Off Campus Study Guidelines apply except when superseded by guidelines and practices of the London Study Program of the College of Liberal Arts. Total credit limited to 36 units.

ARCH 481. Senior Architectural Design Project. 5 units

Term Typically Offered: F, W, SP

Prerequisite: ARCH 451, ARCH 452 and ARCH 453.

Comprehensive building design and research project in an architectural concentration area. Demonstration of professional competency in integration of architectural theory, principles and practice with creative, organizational and technical abilities in architectural programming, design and design research. Total credit limited to 15 units. 5 laboratories.

ARCH 485. Internship/Cooperative Education Experience. 1-12 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Senior standing.

Part-time or full-time professional work experience in architecture and related fields, usually off-campus. Positions are paid or unpaid. Formal report and evaluation by work supervisor required. 30 hours of work experience per quarter per unit of credit. Total credit limited to 24 units.

ARCH 492. Senior Design Thesis. 3 units

Term Typically Offered: F

Prerequisite: ARCH 451, ARCH 452 and ARCH 453. Concurrent: First quarter of ARCH 481.

Development of the framework and format of a thesis project proposal related to the specific design option. Work to include: research topic, intent, scope, methodology, assumptions, outline of work program and documentation. 3 seminars.

ARCH 510. Environmental Design Methods. 3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Application of systematic, step-by-step procedures to rational and intuitive judgmental tasks. Methods for formulation, idea production, evaluation, and testing applied to planning, testing, design information systems, communication between designer and client, user participation in design, and other current topics. 511 focuses on specific problem area among topics and may be repeated up to 9 units. 3 lectures.

ARCH 532. Research Methods in Architecture. 3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Roles of research and analysis in architecture. Approaches to research, hypothesis testing, design process, and systems for design. Use of research findings in various decision-making systems. 3 seminars.

ARCH 551. Architectural Design. 5 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing.

Professional initiative and responsibility in integrating architectural design theory and practice with fields influencing the total environment. Building types considered as the coordinating factor. Total credit limited to 15 units with no more than 5 units in any one quarter. 5 laboratories.

ARCH 561. Advanced Design. 3 units

Term Typically Offered: F, W

Prerequisite: Graduate standing.

Continuation of ARCH 551. Advanced studies integrating architectural design theory and practice with fields influencing the shaping of the total environment. Total credit limited to 9 units. 3 laboratories.

ARCH 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

ARCH 580. Seminar in Theory of Architecture. 3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Directed group study of selected topics in the theory of architecture for graduate students. The Schedule of Classes will list topic selected. Total credit limited to 9 units. 3 seminars.

ARCH 598. Master's Design Project. 3-6 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of graduate advisor.

Completion of a master project demonstrating in-depth research ability at a graduate level. Total credit limited to 9 units. 3 or 6 laboratories.

ARCH 599. Master's Thesis. 1-9 units

Term Typically Offered: TBD

Prerequisite: Consent of graduate advisor.

Completion of a thesis embodying original research in an area of environmental design. Total credit limited to 9 units.

Art (ART)

ART Courses

ART 101. The Fundamentals of Drawing. 4 units

GE Area C3

Term Typically Offered: F, W, SP

Introduction to the artistic practice and cultural value of drawing from the Renaissance to the 21st Century. Emphasis and expansion of the practical skills of observation, rendering, and understanding the signs of meaning produced in visual art. Development of formal techniques, media experimentation, and content creation through personal expression. Exercises to encourage growth in technical skill, conceptual innovation, critical thinking, and visual communication. 3 lectures, 1 laboratory. Fulfills GE C3.

ART 102. Art and Design Foundation Studies I. 4 units

Term Typically Offered: F

Introduces elements and principles of design, establishing a foundation for all artistic practice. Emphasizing critical thinking and creative problem solving, the interrelationship between form and content are examined. Traditional, digital and lens-based media are explored through individual and collaborative experiences. 3 lectures, 1 laboratory.

ART 103. Art and Design Foundation Studies II. 4 units

Term Typically Offered: W

Prerequisite: ART 102.

Visual and aesthetic interactions of color, examined through historical and contemporary models. Formal techniques, media experimentation and content creation, explored through individual and collaborative experiences. 3 lectures, 1 laboratory.

ART 104. Art and Design Foundation Studies III. 4 units

Term Typically Offered: SP

Prerequisite: ART 103.

Principles and essential skills for three-dimensional practice in art and design. Understanding, envisioning, and communicating effectively about space, objects, scale, and the relationship of the body to the built environment. 3 lectures, 1 laboratory.

ART 111. Introduction to Art. 4 units

GE Area C3

Term Typically Offered: F

Designed to acquaint the non-art major with painting, sculpture, drawing, crafts, architecture and printmaking. Development of vocabulary, analytic skills, and research techniques for the understanding of art objects. 4 lectures. Fulfills GE C3.

ART 112. Survey of Western Art. 4 units

GE Area C3

Term Typically Offered: W, SP

History of major art movements in western civilization from ancient art to the twentieth century. Representative periods of western culture, such as the ancient world, the Middle Ages, the Renaissance, and the modern world. 4 lectures. Fulfills GE C3.

ART 122. Basic Digital Photography. 4 units

GE Area C3

Term Typically Offered: F, W, SP

Fundamental techniques in photography. Mechanics of digital cameras, optics, composition, perception of light and subject content. Understanding photographic principles and the language of camera vision. Introduction to the impact of photography on culture. Digital camera required. 3 lectures, 1 laboratory. Fulfills GE C3.

ART 148. Beginning Sculpture. 4 units

GE Area C3

Term Typically Offered: F, W

Exploration of three dimensional form through problems in modeling, casting, carving, and techniques of assembly. Historical and contemporary concepts as applied to the discipline of sculptural styles. 3 lectures, 1 laboratory. Fulfills GE C3.

ART 182. Foundation in Digital Art I. 4 units

Term Typically Offered: F

Introduction to image creation and manipulation, design, illustration, and layout/composition using digital tools, with an emphasis on visual problem solving and creative expression. 3 lectures, 1 laboratory.

ART 183. Foundation in Digital Art II. 4 units

Term Typically Offered: SP

Prerequisite: ART 182.

Development of digital skills in image creation, design, illustration, layout, and simple animation. Emphasis on visual problem solving, creative expression, and narrative. 3 lectures, 1 laboratory.

ART 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ART 201. Intermediate Drawing. 4 units

Term Typically Offered: SP

Prerequisite: ART 101 and ART 102 or ART 106.

Development of additional drawing techniques with emphasis on form content, pictorial space, B/W media, color, mixed media and composition. 3 lectures, 1 laboratory.

ART 203. Art Theory and Practice. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ART 101; and ART 102 or ART 106.

Contemporary issues in art and design, linking 'ideas' to development of concepts. Emphasis on individual creative process, and problem solving. Focus on contemporary critical thinking regarding aesthetics, techniques, and vocabulary. 3 lectures, 1 laboratory.

ART 209. Beginning Painting. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ART 101.

Introduction to technical and formal problems in painting. Exploration of pictorial space, light, and color from observation. Physical characteristics of paint, various tools, studio methods, and styles of painting. 3 lectures, 1 laboratory.

ART 211. Art Hist - Ancient to Renaissance. 4 units

Term Typically Offered: TBD

Development of art from antiquity to the early stages of the Renaissance in Europe. Particular emphasis on European art with appropriate references to sources from antiquity which have been particularly influential on European painting and sculpture. Comparison of relevant parallel examples of the art of non-European cultures. 4 lectures.

ART 212. Art History - Renaissance through Baroque Eras. 4 units

Term Typically Offered: W, SP

The significant visual expressions of Northern and Southern European art of the Renaissance and Baroque period. Relevant parallel examples of the art of antiquity and non-European cultures. 4 lectures.

ART 213. Art History- Modern Art, 1900-1945. 4 units

Term Typically Offered: F

Examines the development of significant styles and movements in modern art, including Fauvism, German Expressionism, Cubism, Futurism, Neo-Plasticism, Russian and Soviet avant-gardes, Dada, Surrealism, and/or American modernism. Also introduces selected modern developments in graphic design and photography. 4 lectures. Replaces ART 312.

ART 222. Black and White Photography. 4 units

Term Typically Offered: SP

Control and understanding of tonal range under available light. Composition, camera based visual communication skills and concept development. Emphasis on 'photographic seeing' and professional quality printing. 2 lectures, 2 laboratories.

ART 224. Introduction to Artificial Lighting for Photography. 4 units

Term Typically Offered: F, W, SP

Introduction to studio lighting and contemporary professional studio photography. Production of professional quality prints using digital camera and printing methods. 3 lectures, 1 laboratory.

ART 227. Portrait Photography. 4 units

Term Typically Offered: SP

Prerequisite: ART 224.

Studio and environmental portraiture. Emphasis on light ratios/patterns; posing and methods of personality portrayal. 3 lectures, 1 laboratory.

ART 237. Graphic Design I. 4 units

Term Typically Offered: F

Prerequisite: ART 104 and ART 183; Art and Design majors only.

Exploration of the technical and conceptual underpinnings of graphic design. Focus on the design process and how raw ideas are translated into professional work. 3 lectures, 1 laboratory.

ART 238. Typography I. 4 units

Term Typically Offered: W

Prerequisite: ART 104 and ART 183; Art and Design majors only.

Fundamentals of theory, practice, technology and history of typography. Exercises include the study of letterforms, type with image, proportion and grids, hierarchy, and legibility. 3 lectures, 1 laboratory.

ART 245. Ceramics I. 4 units

Term Typically Offered: SP

Prerequisite: ART 104 or ART 107.

Studio course in basic clay working with emphasis on design quality, hand building, and use of the potter's wheel. 3 lectures, 1 laboratory.

ART 260. Critique, Discourse and Practice. 4 units

Term Typically Offered: SP

Prerequisite: ART 101 and ART 104.

Developing an individual body of artwork. Rigorous critiques, lectures, and seminar-style discussions aimed at forming a process for discussing artwork. Art writing, research, and individual conceptual and formal development. 4 lectures.

ART 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ART 288. Interaction Design I. 4 units

Term Typically Offered: SP

Prerequisite: ART 237 and ART 238.

An introduction to concepts, uses and design principles of interactive media. Exploration of methods for planning and implementing interaction design projects. Not open to students with credit in ART 380. 3 lectures, 1 laboratory.

ART 302. Figure Drawing. 4 units

Term Typically Offered: F, W

Prerequisite: ART 101.

Development of advanced drawing methods and techniques in the study of the human form and structure as it relates to proportion, anatomical analysis, and figure/ground relationships. Understanding materials, techniques, and ideas in the practice of contemporary figure drawing. 3 lectures, 1 laboratory.

ART 309. Intermediate Painting. 4 units

Term Typically Offered: W

Prerequisite: ART 209.

Continued study of technical and formal problems in painting. Emphasis on the creative process, development of individual ideas, and the connection between form and content. Contemporary issues in painting introduced. 3 lectures, 1 laboratory.

ART 310. Art History - American Art. 4 units

Term Typically Offered: SP

Prerequisite: ART 112, ART 211, or ART 212.

Major historical periods of American art from the colonial period to the present. Special emphasis will be given to the broader notion of American art as a process of developing an identity of the varied historical and sociological forces that have shaped images in American art. 4 lectures.

ART 311. Art History - Nineteenth Century Art. 4 units

GE Area C4

Term Typically Offered: F

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and ART 111 or ART 112 or ART 211 or ART 212.

History of painting and sculpture from the French Revolution to the beginning of the 20th century. Focuses on significant movements such as Neo-Classicism, Romanticism, Realism, Impressionism and Post-Impressionism. 4 lectures. Fulfills GE C4 except for Art and Design majors.

ART 313. Design History. 4 units

Term Typically Offered: SP

Prerequisite: One of the following: ART 112, ART 211, ART 212, or ART 213.

Survey of design from the Victorian era to the present, including major philosophies and movements, political, social, cultural, and technological trends that influenced designers in the 20th century. 4 lectures.

ART 314. History of Photography. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area C3.

In-depth survey of the artistic and cultural achievements in photography from its invention to the present day. Significant photographers, the evolution of aesthetic criteria in the context of other visual arts as well as social/cultural impact. 4 lectures. Fulfills GE C4 except for Art and Design majors.

ART 315. Art History - Art Since 1945. 4 units

Term Typically Offered: W

Prerequisite: ART 112 or ART 211 or ART 212 or ART 213; and Junior standing.

History of visual art from 1945 to the present. Focus on significant movements such as Abstract Expressionism, Pop art, minimalism, conceptual art, earthworks, feminism, and postmodernism. Also focus on new mediums such as performance, video, and installation. 4 lectures.

ART 316. Women as Subject and Object in Art History. 4 units

Term Typically Offered: TBD

Prerequisite: one of the following: ART 111, ART 112, ART 211, ART 212, ART 213, or WGS 201.

Exploration of the role of women in the visual arts. Women as artists, women as portrayed in art, and feminist theory as it applies to the study of the visual arts and art history. 4 lectures. Crosslisted as ART/WGS 316.

ART 317. Asian Art Survey. 4 units

Term Typically Offered: TBD

Prerequisite: One of the following: ART 111, ART 112, ART 211, or ART 212.

Survey of the traditional arts of Asia - primarily India, China and Japan. Emphasis on the connections between the visual arts in Asia and the philosophical, social and cultural environments in which they arose. 4 lectures.

ART 318. Asian Art Topics: National, Religious, and Intellectual Movements. 4 units

GE Area C4

Term Typically Offered: W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area C3.

In-depth examination of significant art movements in Asia. Each topic will focus on the development of art in Asia within the context of a specific geographical or theoretical framework. Details will vary depending on topic. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Fulfills GE C4 except for Art and Design majors.

ART 324. Photographic Expression. 4 units

Term Typically Offered: F

Prerequisite: ART 122 or ART 224. Recommended: ART 222.

Emphasis on personal expression and developing style, introduction to symbology, visual source development and the work of contemporary creative photographers. Total credit limited to 8 units. 3 lectures, 1 laboratory.

ART 325. Advanced Camera and Lighting Techniques. 4 units

Term Typically Offered: F

Prerequisite: ART 224.

Emphasis on advanced camera and lighting techniques. Use of architectural exteriors, interiors, landscapes and studio set-ups to assist mastery of large format cameras. Other topics include perspective and sharpness correction, lighting (available and artificial), digital imaging and studio equipment. 3 lectures, 1 laboratory.

ART 329. Editorial Photography. 4 units

Term Typically Offered: W

Prerequisite: ART 325.

Creating, lighting and executing editorial assignments. Producing photography for corporate needs, i.e. annual reports, online presentations, brochures and in-house publications. Emphasis on selecting subject matter and handling lights. 3 lectures, 1 laboratory.

ART 330. Book Arts. 4 units

Term Typically Offered: SP

Numerous traditional book structures and derivations including accordion, pamphlet, stab, and multiple signature construction. Emphasis on both craftsmanship and experimentation. Hands-on experience and a broad historical overview of paper and book arts. 3 lectures, 1 laboratory.

ART 334. Illustration I: Techniques and Tools. 4 units

Term Typically Offered: TBD

Prerequisite: ART 101.

Introduction to the basic practices of commercial illustration as used in the visual communications industry. Emphasis on the generation of ideas, rendering techniques and tools, and self marketing methods, with an overview of the history of illustration. 3 lectures, 1 laboratory.

ART 337. Graphic Design II. 4 units

Term Typically Offered: F

Prerequisite: ART 237 and ART 238; Art and Design majors only.

Exploration of identity design problems through the use of symbolism and metaphor. Design and implementation of corporate logos. 3 lectures, 1 laboratory.

ART 338. Typography II. 4 units

Term Typically Offered: W

Prerequisite: ART 238; Art and Design majors only.

Exploration of typography in the form of text. Application of different typefaces, composition, layout and page systems for the design of periodicals and books. 3 lectures, 1 laboratory.

ART 345. Ceramics II. 4 units

Term Typically Offered: SP

Prerequisite: ART 104 or ART 107; and ART 148 or ART 245.

Studio course in hand, wheel, mold, extruder, jigger, and press forming skills. Design of single and multiple forms and kiln firing procedures. Total credit limited to 8 units. 3 lectures, 1 laboratory.

ART 348. Intermediate Sculpture. 4 units

Term Typically Offered: W

Prerequisite: ART 104 or ART 107 and ART 148.

Intermediate sculpture course in expressive use of form with modeling, casting, carving, and/or assembly. Total credit limited to 8 units. 3 lectures, 1 laboratory.

ART 350. Computing for Interactive Arts Capstone I. 2 units

Term Typically Offered: W

Prerequisite: ART 384; CSC/CPE 102 and CSC/CPE 103, or CSC/CPE 202 and CSC/CPE 203; and junior standing.

Definition and specification of a team-based creative collaboration on a digital interactive art project (e.g. animation, video game, interactive media display, etc). Research and techniques, project planning and project team organization, prototype creation. 1 lecture, 1 laboratory. Crosslisted as ART/CSC 350.

ART 353. Intermedia / Art. 4 units

Term Typically Offered: SP

Prerequisite: ART 101; ART 102 or ART 106; and ART 148.

Studio course emphasizing individual and collaborative creative exploration with project content derived from student's experience. Focus on using traditional as well as new genres of artistic expression such as site specific installations, video art, book works, and performance art. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory.

ART 366. Junior Studio Art Practice. 4 units

Term Typically Offered: F

Prerequisite: ART 148, ART 201, ART 260, ART 209 and junior standing.

Critiques, lectures, and seminar-style discussions aimed at establishing a rigorous creative practice. Includes art writing, research, and individual conceptual and formal development. 3 lectures, 1 laboratory.

ART 370. Michelangelo. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: For non-ART majors: Junior standing; completion of GE Area A with a grade of C- or better; and one course from Area C3; For ART majors: ART 211, or ART 212, or ART 213.

The art and life of Michelangelo (1475-1564), the renowned painter, sculptor, architect, and poet, with reference to early biographies, his artistic development, and the demands of his patrons. 4 lectures. Fulfills GE C4 except for Art and Design majors.

ART 371. Topics in Renaissance Art. 4 units

GE Area C4

Term Typically Offered: F, SP

Prerequisite: For non-ART majors: Junior standing; completion of GE Area A with a grade of C- or better; and one course from Area C3; For ART majors: ART 211, or ART 212, or ART 213.

A thematic analysis of Renaissance Art (1300-1600) with special attention paid to politics, patronage, myth, religion, and the development of new genres and subject matter. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Fulfills GE C4 except for Art and Design majors.

ART 373. New Media Art History. 4 units

Term Typically Offered: SP

Prerequisite: ART 111 or ART 212 or ART 213.

In-depth study of past and contemporary media arts practices. Explores different approaches used by media artists in the 20th and 21st centuries to examine new media and how the lenses of new technologies are used by artists to present knowledge and alter social, cultural and political behaviors. 4 lectures.

ART 383. Digital Video I. 4 units

Term Typically Offered: F, SP

Prerequisite: ART 122 or ART 224.

Introduction to the use of the DSLR camera as a tool for shooting video and basic digital editing including audio editing. Topics will include scripting, storyboarding, composition, motion, editing, lighting and sound. Emphasis on effective communication and expression. 2 lectures, 2 laboratories.

ART 384. Digital 3D Modeling and Design. 4 units

Term Typically Offered: W

Prerequisite: ART 182.

Development of skills and techniques in the use of three-dimensional design and modeling via digital technology. Capabilities of current software in the design and modeling of three-dimensional form. 2 lectures, 2 activities.

ART 388. Interaction Design II. 4 units

Term Typically Offered: F

Prerequisite: ART 288.

Design of original and innovative digital products of interaction design in different media, using user-centered design and usability analysis. Design research methods to engage potential users form the beginning to the end of the design process. 3 lectures, 1 laboratory.

ART 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing and consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ART 402. Advanced Figure 2D. 4 units

Term Typically Offered: W

Prerequisite: ART 302.

Advanced problems in figure drawing and painting. Advanced methods and techniques in the study of the human form as it relates to technical and conceptual issues. Includes working from direct observation of the figure and the development of individual content and approaches. Total credit limited to 8 units. 3 lectures, 1 laboratory.

ART 409. Advanced 2-D. 4 units

Term Typically Offered: SP

Prerequisite: ART 201 or ART 309.

Advanced problems in painting and drawing. Emphasis on the creative process from initial concept to the finished work of art. Investigation of traditional, non-traditional and explorative work to encourage development of personal approach. Total credit limited to 8 units. 3 lectures, 1 laboratory.

ART 427. Advertising Photography. 4 units

Term Typically Offered: W

Prerequisite: ART 325 and senior standing.

Applied principles of design and color to produce a photograph that sells an idea, product, or service. Joint projects with ART 432, Advertising Design. Emphasis on thinking, planning, interpreting, and presenting an idea photographically. 3 lectures, 1 laboratory.

ART 432. Advertising Design. 4 units

Term Typically Offered: W

Prerequisite: ART 337 and ART 338 and senior standing or consent of instructor.

Development of print advertising from concept to final presentation. Emphasis on art direction, photo direction and copywriting. For Art and Design majors only. Computer applications are required for appropriate problems. 3 lectures, 1 laboratory.

ART 434. Illustration II. 4 units

Term Typically Offered: TBD

Prerequisite: ART 209, ART 334, or consent of instructor; for Art and Design majors only.

Advanced development of concepts and illustration techniques and skills, both as analogue and digital, for use in a variety of graphic design applications such as editorial/publication, retail, educational, technical, or advertising purposes. 3 lectures, 1 laboratory.

ART 437. Graphic Design III. 4 units

Term Typically Offered: W

Prerequisite: ART 337 and ART 338; for Art and Design majors only.

Advanced graphic design. The creation of basic 3-D structures, and the application of graphics in 3-D environments (such as package design and signage). Emphasis on integrative communication activity of all elements including: color, graphics, 3-D forms, typography, and constructions, and includes market research. 3 lectures, 1 laboratory.

ART 438. Typography III. 4 units

Term Typically Offered: SP

Prerequisite: ART 338; for Art and Design majors only.

Advanced exploration of communication and structural aspects of typography. Focus on experimentation and expressively using type to enhance meaning. 3 lectures, 1 laboratory.

ART 439. Type in Motion. 4 units

Term Typically Offered: TBD

Prerequisite: ART 438, ART 488; for Art and Design majors only.

Sequential organization of typographic information in time and how ideas such as intonation, proximity, pacing, rhythm and progression can influence and shape meaning. Focus on animated typography for a range of applications. 3 lectures, 1 laboratory.

ART 448. Advanced Topics in Sculpture. 4 units

Term Typically Offered: TBD

Prerequisite: ART 348.

Studio course specializing in three-dimensional form. Materials include clay, plaster, metal, or wood. Course content will be selected from various topics that are representational, abstraction, non-objective, or conceptual. The Schedule of Classes will list topic selected. Total credit limited to 8 units; may be in same term. 3 lectures, 1 laboratory.

ART 450. Computing for Interactive Arts Capstone II. 2 units

Term Typically Offered: TBD

Prerequisite: ART/CSC 350.

Team-based design, construction and deployment of a collaborative interactive computational art project typically found in the fields of animation, game design, and interactive media. Management of interdisciplinary teams, documentation, creative development, testing, and assessment. 2 laboratories. Crosslisted as ART/CSC 450.

ART 463. Senior Portfolio Project. 4 units

Term Typically Offered: SP

Prerequisite: Senior standing; and ART 260.

Planning, preparation, and physical production of a portfolio of work for entrance into the professional job market or graduate school. 3 lectures, 1 laboratory.

ART 466. Senior Studio Art Practice. 4 units

Term Typically Offered: W

Prerequisite: ART 366 and senior standing.

Builds upon content explored in ART 366. Critiques, lectures, and seminar-style discussions aimed at establishing a rigorous creative practice. Art writing, research, and individual conceptual and formal development. 3 lectures, 1 laboratory.

ART 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: W, SP

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

ART 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: W

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

ART 474. Collaborative Studio: Rendering, Animation and Modeling. 4 units

Term Typically Offered: SP

Prerequisite: ART 384.

A collaborative visualization and design studio focusing on rendering, animation and modeling. Modeling and animation software for design conceptualization and expression. Collaboration in teams. Total credit limited to 8 units. 2 lectures, 2 activities.

ART 483. Digital Video II. 4 units

Term Typically Offered: W

Prerequisite: ART 383.

Advanced practices in digital video. Creation of genre-specific narratives using methods in storyboarding, shooting, editing, and sound design. Advanced methods of storytelling, including documentary video, web-based narratives, and fine art video practices. Creation of quality expressive videos. 2 lectures, 2 laboratories.

ART 484. Animation, Video, and Interactive Design. 4 units

Term Typically Offered: SP

Prerequisite: ART 122 or ART 182 or ART 224.

Creation of in-depth animations and interactive presentations. Advanced scripting, storyboarding, video production, and interactive communication techniques. 3 lectures, 1 laboratory.

ART 488. Interaction Design III. 4 units

Term Typically Offered: TBD

Prerequisite: ART 388.

Advanced development of complex systems in the interaction design space and an exploration of emerging technologies. 3 lectures, 1 laboratory.

ART 489. Advanced Interactive Media Art. 4 units

Term Typically Offered: TBD

Prerequisite: ART 488.

Advanced topics in the digital media field such as interface design, information architecture techniques, digital typography and interactive storytelling. Survey of new applications of design for the new media, and the development of digital portfolio pieces. 3 lectures, 1 laboratory.

ART 494. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 12 units. Credit/No Credit grading only.

ART 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 12 units. Credit/No Credit grading only.

Astronomy and Astrophysics (ASTR)

ASTR Courses

ASTR 101. Introduction to the Solar System. 4 units

GE Area B3

Term Typically Offered: F,W,SP,SU

Descriptive astronomical properties of the Earth, Moon, other planets and their satellites. Comets, asteroids and other members of the Solar System. Theories of the formation of the Solar System. Opportunities for telescope observations. Intended for non-engineering and non-science majors. Not open to students who have completed or are taking ASTR 301 or ASTR 302. 4 lectures. Fulfills GE B3.

ASTR 102. Introduction to Stars and Galaxies. 4 units

GE Area B3

Term Typically Offered: F, W, SP

Descriptive astronomical properties of the Sun, stars, galaxies and interstellar material. Expanding universe and cosmological models. Opportunities for telescope observations. Not open to students who have completed or are taking ASTR 112, ASTR 301, ASTR 302, or PHYS 132. 4 lectures. Fulfills GE B3.

ASTR 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ASTR 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ASTR 301. Planetary Systems. 3 units

Term Typically Offered: W

Prerequisite: PHYS 132 or PHYS 122 and MATH 141 or MATH 161.

Quantitative and descriptive properties of planetary systems, including our solar system. Physics of planets and their formation, moons, comets, and interplanetary media. Extrasolar planets and astrobiology. 3 lectures.

ASTR 302. Stars and Galaxies. 3 units

Term Typically Offered: SP

Prerequisite: PHYS 122 or PHYS 132; and MATH 141 or MATH 161.

Quantitative and descriptive properties of stars, galaxies and interstellar material; including stellar structure and evolution, and structure and evolution of galaxies. 3 lectures.

ASTR 324. Longitude, Navigation, and Timekeeping. 4 units

GE Area F

Term Typically Offered: W

Prerequisite: Junior standing and completion of GE Area B, MATH 119 or equivalent.

The state of navigation prior to 1800 and the world wide problem of determining longitude at sea. Emphasis on historical and modern-day scientific solutions to the longitude problem and navigation technology, time and timekeeping, celestial navigation, and awareness of technological solutions to societal problems. 4 lectures. Fulfills GE Area F.

ASTR 326. Cosmology. 3 units

Term Typically Offered: F

Prerequisite: PHYS 211 (may be taken concurrently).

Introduction to the basic ideas of modern observational cosmology from the Big Bang to the ultimate fate of the universe. Topics include: special and general relativity, curvature of space, dark matter, dark energy, cosmic microwave background, type Ia supernovae. 3 lectures.

ASTR 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ASTR 404. Research Experience for Advanced Undergraduates. 1-2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigations, research, studies, or surveys of selected problems. Credit/No Credit grading only. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ASTR 444. Observational Astronomy. 4 units

Term Typically Offered: F

Prerequisite: ASTR 302.

Introduction to observational astronomy. Coordinate systems, telescopes and observational instruments (CCDs, filters, spectrographs), observational methods and techniques, data reduction and analysis. Laboratory activities include use of a telescope, CCD camera for data acquisition, data reduction and analysis, and presentation of results. 3 lectures, 1 laboratory.

ASTR 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ASTR 471. Selected Advanced Laboratory. 1-2 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 2 laboratories.

BioResource and Agricultural Engineering (BRAE)

BRAE Courses

BRAE 121. Agricultural Mechanics. 2 units

Term Typically Offered: F, W

Identification and use of tools and materials; shop safety; tool sharpening and care; concrete mixes and materials; simple electric wiring; metal work; pipe fitting; basic woodworking; estimating quantities and costs. Students are required to meet safety regulations in laboratory work. 1 lecture, 1 laboratory.

BRAE 128. Careers in Bioresource and Agricultural Engineering. 2 units

Term Typically Offered: F

Introduction to careers associated with BioResource and Agricultural Engineering, and Agricultural Systems Management. Professional engineering registration process. Engineering problem solution and report format. Design procedures. Engineering fundamentals. Laboratory includes visits to facilities relating to career opportunities. 1 lecture, 1 laboratory.

BRAE 129. Laboratory Skills and Safety. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: BRAE and ASM majors only.

Introduction to fabrication and construction materials used in the field of Agricultural Engineering. Fabrication skills in the development of wood, metal, concrete projects, and creative design. Strength tests of wood, fasteners, concrete, and student design projects. 1 laboratory.

BRAE 133. Introduction to Engineering Design Graphics. 1 unit

Term Typically Offered: F, W

Visual communication in engineering design and problem solving. Principles of freehand sketching, engineering graphics, and computer-aided-drafting. Perspective and orthographic sketching, orthographic drawing with instruments and computer, applied descriptive geometry. 1 laboratory.

BRAE 141. Agricultural Machinery Safety. 3 units

Term Typically Offered: F, SP

Evaluation of safe tractor and equipment operation. Supervised field operation emphasizing the safe and efficient performance of modern farm and utility-industrial equipment. 2 lectures, 1 laboratory.

BRAE 142. Agricultural Power and Machinery Management. 4 units

Term Typically Offered: F

Prerequisite: MATH 116 or equivalent.

Evaluation of agricultural machinery and tractor power performance. Equipment studied includes primary and secondary tillage tools, grain drills, row crop planters, sprayers, grain and forage harvesters, and specialty crop harvesters. Emphasis on management, selection, cost analysis using computers and efficient operation of agricultural machinery. 3 lectures, 1 laboratory.

BRAE 151. CAD for Agricultural Engineering. 1 unit

Term Typically Offered: F, W

Computer aided drafting on a desktop personal computer using Autocad software. Drawing setup. 2-D projections including automatic dimensioning and hatching. Isometric construction, drawing layers, library symbols. Use of 3-D drawing software. 1 laboratory.

BRAE 152. 3-D Solids Modeling. 1 unit

Term Typically Offered: W, SP

Prerequisite: BRAE 133, BRAE 151 or equivalent courses.

Introduction to 3-dimensional solids modeling using state-of-the-art software. Model generation and modification of associative properties, assembly modeling, extrusions and revolutions. 1 laboratory.

BRAE 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

BRAE 203. Agricultural Systems Analysis. 4 units

Term Typically Offered: W

Prerequisite: MATH 118 or equivalent.

Agricultural Systems Analysis investigates the interrelationships between sub-components in an overall system. Problem solving algorithms, network analysis, project planning techniques, and optimization. 2 lectures, 2 activities.

BRAE 213. Bioengineering Fundamentals. 2 units

GE Area B2

Term Typically Offered: F, W, SP

Prerequisite: MATH 142; for engineering students only. Corequisite: BIO 213. Recommended: CHEM 124.

Treatment of the engineering applications of biology. Genetic engineering and the industrial application of microbiology. Systems physiology with engineering applications. Structure and function relationships in biological systems. The impact of life on its environment. Course may be offered in classroom-based or online format. 2 lectures. Crosslisted as BMED/BRAE 213. Fulfills GE B2.

BRAE 216. Fundamentals of Electricity. 4 units

Term Typically Offered: F

Prerequisite: BRAE 129, MATH 142, PHYS 131.

Application of electricity in BioResource and Agricultural Engineering, including basic electric circuits. Will include wiring materials, code regulations, electrical measurements, R-L-C circuit fundamentals, system planning, motors, basic electronics, and an introduction to computer usage. 3 lectures, 1 laboratory.

BRAE 232. Agricultural Structures Planning. 4 units

Term Typically Offered: SP

Prerequisite: BRAE 151, PHYS 132.

Planning of facilities required in production systems. Materials and processes used in construction of agricultural structures. Environmental factors affecting crop storage structures and animal housing. Design of structural environments to meet the needs of commodities, animals, and plants. 3 lectures, 1 laboratory.

BRAE 234. Introduction to Mechanical Systems in Agriculture. 4 units

Term Typically Offered: SP

Prerequisite: PHYS 131.

Introduction to elements used in the mechanical transmission of power and force in agricultural systems. Power transmission using v-belts. roller chain, gear and shaft drives, hydraulic actuators. Linear and nonlinear actuation devices including linkages, cams, and hydraulic/pneumatic cylinders. 3 lectures, 1 laboratory.

BRAE 236. Principles of Irrigation. 4 units

Term Typically Offered: F

Prerequisite: MATH 141, SS 121.

Land grading design, operation, management, and evaluation of irrigation methods. 3 lectures, 1 laboratory.

BRAE 237. Introduction to Engineering Surveying. 2 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 119 or equivalent.

An introduction to basic field note keeping as well as the use of steel tapes, automatic levels, total stations and survey tools. Training in the procedures for differential and profile leveling; angle measurement and traversing. Hands-on experience with the use of GPS for surveying. An understanding in computations to determine direction, elevations, and earthwork volumes. Practice in map reading and building layout. 1 lecture, 1 laboratory.

BRAE 239. Engineering Surveying. 4 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 119 or equivalent.

Development of proper field note taking and procedures for measuring using automatic levels, total stations and GPS systems. Understanding in the procedures and computations for differential leveling, profiles, traversing, triangulation and topographic surveys. Computations in traverse adjustment, contour mapping, earthwork volumes, curve alignments and building layout. Understanding in map reading, the use of datums, photogrammetry, CAD design and boundary law. 2 lectures, 2 laboratories.

BRAE 240. Agricultural Engineering Laboratory. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual projects. Total credit limited to 4 units. 1 laboratory.

BRAE 244. Precision Farming. 4 units

Term Typically Offered: W

Prerequisite: AEPS 133 or AEPS 190 or AEPS 260 or BRAE 237 or BRAE 239.

Precision agriculture applications. Integrating GIS, GPS, and remote sensing technologies with site-specific farming practices to optimize agricultural productivity. Field trip required. 3 lectures, 1 laboratory. Crosslisted as AEPS/BRAE 244.

BRAE 247. Forest Surveying. 2 units

Term Typically Offered: TBD

Prerequisite: NR 215.

Use and care of tapes, staff compass, abney levels, total stations, and GPS receivers. Keeping field notes, measurements by tape. Closed and open traverse by compass and total stations. Turning angles and determining directions of lines. Map reading and public land description. GPS measurements. Weekend field trips required. 1 lecture, 1 laboratory. Crosslisted as BRAE/NR 247.

BRAE 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

BRAE 301. Hydraulic and Mechanical Power Systems. 4 units

Term Typically Offered: SP

Prerequisite: PHYS 121 or PHYS 141.

Selection, application and use of hydraulic components and mechanical power transmission equipment. Use of standardized circuit design procedures. 3 lectures, 1 laboratory.

BRAE 302. Servo Hydraulics. 4 units

Term Typically Offered: W

Prerequisite: BRAE 216 or BRAE 324 and BRAE 234 or BRAE 301.

Application of microcomputers and programmable logic controllers to hydraulic, pneumatic and mechanical systems. Theory, instrumentation and sensors used in process and control systems used in agricultural equipment. 3 lectures, 1 laboratory.

BRAE 312. Hydraulics. 4 units

Term Typically Offered: F

Prerequisite: PHYS 132, ME 211.

Static and dynamic characteristics of liquids, flow in open and closed channels, uniform and nonuniform flow, flow measurement, pumps. 3 lectures, 1 laboratory.

BRAE 320. Principles of Bioresource Engineering. 4 units

Term Typically Offered: SP

Prerequisite: BRAE 232, BRAE 236, PHYS 132.

Theory and applications of bioprocess technology in biological and agricultural systems. Engineering properties of biological materials and organisms. Basic unit operations, fluid mechanics and heat/mass transfer as applied to bioprocess technology. Special requirements of agricultural and biological processes. 3 lectures, 1 laboratory.

BRAE 321. Agricultural Safety. 3 units

Term Typically Offered: W

Prerequisite: Junior standing.

Principles of agricultural safety. Accident causation and prevention, hazard identification and abatement, laws and regulations. Machinery, electrical, chemical, livestock, shop and fire safety. Safety program development. 2 lectures, 1 activity.

BRAE 324. Principles of Agricultural Electrification. 4 units

Term Typically Offered: W

Prerequisite: MATH 119, PHYS 121.

Applications of DC/AC electricity in agriculture. National Electric Code regulations. The wiring of agricultural structures and electrical distribution. Series, parallel and series-parallel circuits, R-L-C circuits, electric motors, electronics. 3 lectures, 1 laboratory.

BRAE 328. Measurements and Computer Interfacing. 4 units

Term Typically Offered: W

Prerequisite: EE 321; EE 361; and CSC 231 or CSC 232 or CSC 234.

Transducers and engineering measurements in agricultural engineering. Covering transducer characteristics, signal processors and controllers, instrumentation techniques, and the use of the computer in the measurement and control of typical engineering problems. 3 lectures, 1 laboratory.

BRAE 331. Irrigation Theory. 3 units

Term Typically Offered: W

Prerequisite: BRAE 236, or BRAE 340.

Plant-water-soil relations using evapo-transpiration, plant stress, soil moisture deficiency, frequency and depth of irrigation, salinity, infiltration, drainage and climate control. 3 lectures.

BRAE 335. Internal Combustion Engines. 4 units

Term Typically Offered: W

Prerequisite: Junior standing.

Principles of operation of internal combustion engines. Theory of operation and diagnosis evaluation and repair of small engines, gasoline and diesel engines and economics of operation, use and repair. Power analysis and application. 3 lectures, 1 laboratory.

BRAE 337. Landscape Irrigation. 4 units

Term Typically Offered: W

Prerequisite: MATH 118.

Design of sprinkler and drip irrigation systems including: site characteristics, soil variables affecting water storage and infiltration rate, plant selection and hydrozones, hydraulics, nozzle spacing, selection of system components, back flow prevention, plumbing codes and cost estimating. Irrigation system evaluation and audit irrigation scheduling, and water budget. 3 lectures, 1 laboratory.

BRAE 339. Internship in Bioresource and Agricultural Engineering. 1-12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of internship instructor.

Students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 6 units. Credit/No Credit grading only.

BRAE 340. Irrigation Water Management. 4 units

GE Area F

Term Typically Offered: F, W, SP

Prerequisite: Junior standing, completion of GE Area B, and Math 118 or higher.

Soil-plant-water relationships; evapotranspiration; irrigation schedules; salinity and drainage; irrigation efficiency. Water measurement; soil moisture measurement; irrigation systems and practical constraints affecting scheduling. California water supply and budget; water rights; local, state and federal water institutions; California water issues. 3 lectures, 1 laboratory. Fulfills GE Area F.

BRAE 342. Agricultural Materials. 4 units

Term Typically Offered: F

Prerequisite: PHYS 121, SS 121, MATH 119.

Physical properties of agricultural materials and their measurement. Strength of materials, material flow and transport, material deformation, shape and size classification, moisture relationships and biological interactions. Interactions between agricultural materials, the environment and equipment used to handle them. 3 lectures, 1 laboratory.

BRAE 343. Mechanical Systems Analysis. 4 units

Term Typically Offered: W

Prerequisite: BRAE 342.

Use of statics and dynamics to make original calculations, plans, sketches, graphics, drawings, schemes and layouts for the fabrication and construction of machines. 3 lectures, 1 laboratory.

BRAE 344. Fabrication Systems. 4 units

Term Typically Offered: SP

Prerequisite: BRAE 343.

Fabrication systems including cutting, sawing, shearing, bending, welding, grinding, cleaning, painting and proper safety procedures. Experimental projects to include team design and construction, presentation, organization, and evaluation. 2 lectures, 2 laboratories.

BRAE 345. Aerial Photogrammetry and Remote Sensing. 3 units

Term Typically Offered: F, W

Prerequisite: MATH 118.

Object recognition, three-dimensional equipment, and interpretation of aerial photographs. Print alignment, stereoscopic viewing, scales, elevation determination, and application. Orthophotos and their relationship to Geographic Information Systems (GIS). Application of aerial photos to regional studies. 2 lectures, 1 laboratory.

BRAE 348. Energy for a Sustainable Society. 4 units

GE Area F

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and completion of GE Area B.

Study of how the transition can be made from fossil fuels to renewable energy sources including hydro, biomass, solar, wind, and energy conservation. Environmental, economic, and political consequences of a renewable energy-based sustainable society. 3 lectures, 1 activity. Fulfills GE Area F.

BRAE 400. Special Problems. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems in agriculture. Total credit limited to 8 units, with a maximum of 4 units per quarter.

BRAE 403. Agricultural Systems Engineering. 4 units

Term Typically Offered: SP

Prerequisite: MATH 242 or MATH 244.

Engineering and economic principles combined with mathematical optimization techniques to evaluate parameters in agricultural production and processing systems. Project planning techniques, linear and nonlinear modeling, response surface methodology. Professional responsibilities in Agricultural Engineering including ethics, patents, copyrights, liability. 3 lectures, 1 laboratory.

BRAE 405. Chemigation. 1 unit

Term Typically Offered: SP

Prerequisite: BRAE 236 or BRAE 340; or graduate standing.

Fertilizer and chemical injection through irrigation systems. Hardware, fertilizer compounds, and distribution uniformity. Matching chemicals and equipment to specific irrigation methods. Safety. 1 laboratory.

BRAE 414. Irrigation Engineering. 4 units

Term Typically Offered: SP

Prerequisite: BRAE 331 or BRAE 340; BRAE 312 with a grade of C or better; or graduate standing.

Design of on-farm irrigation systems; micro, surface, and sprinkler irrigation systems; canals and pumps; economic and strategies of pipe design; pipeline protection. 3 lectures, 1 laboratory.

BRAE 418. Agricultural Systems Management I. 4 units

Term Typically Offered: F

Prerequisite: BRAE 203; AGB 301; AGB 310; and completion of GE Area A3 with a grade of C- or better; or graduate standing.

Project management of agricultural systems. Emphasis placed on a team approach to problem solution. Case studies and student projects used to explore the following topics: project leadership, project organization, communication, needs assessment, feasibility studies, cost analysis, decision making, solution implementation, and evaluation. 3 lectures, 1 laboratory.

BRAE 419. Agricultural Systems Management II. 4 units

Term Typically Offered: W

Prerequisite: BRAE 418.

Project management of agricultural systems. Emphasis placed on a team approach to problem solution. Case studies and student projects used to explore the following topics: project leadership, project organization, communication, needs assessment, feasibility studies, cost analysis, decision making, solution implementation, and evaluation. 2 lectures, 2 laboratories.

BRAE 421. Equipment Engineering. 3 units

Term Typically Offered: F

Prerequisite: BRAE 152; CE 204; and ME 212.

Design and construction of specialized agricultural components and equipment. 2 lectures, 1 laboratory.

BRAE 422. Equipment Engineering. 4 units

Term Typically Offered: W

Prerequisite: BRAE 421.

Design and construction of specialized agricultural components and equipment. 2 lectures, 2 laboratories.

BRAE 425. Computer Controls for Agriculture. 3 units

Term Typically Offered: SP

Prerequisite: BRAE 324.

Computer activated controls as applied to agricultural machinery, agricultural structures, processing and irrigation industries. Encompassing control logic to evaluate stability behavior of systems of computer interfacing, data input and control output. 2 lectures, 1 laboratory.

BRAE 428. Agricultural Robotics and Automation. 4 units

Term Typically Offered: SP

Prerequisite: BRAE 328.

Agricultural applications of signal processing, control theories, machine vision and robot basics for agricultural production and processing.

Approaches and constraints related to agricultural automation and the use of robotics in field applications. Engineering approach to problem-solving and experimental data analysis. Field trip required. 3 lectures, 1 laboratory.

BRAE 432. Agricultural Buildings. 4 units

Term Typically Offered: SP

Prerequisite: PHYS 121, BRAE 342, BRAE 343.

Selection of buildings, storage units, and related equipment for production agriculture. Economics and functionality of various designs and construction materials. Environmental factors affecting crop storage and animal housing. 3 lectures, 1 laboratory.

BRAE 433. Agricultural Structures Design. 4 units

Term Typically Offered: F

Prerequisite: BRAE 232, CE 204.

Structural analysis and design of agricultural service and processing buildings. Emphasis on use of wood, metals, and reinforced concrete in light construction. 3 lectures, 1 laboratory.

BRAE 434. Automotive Engineering for a Sustainable Future. 4 units

Term Typically Offered: W

Prerequisite: Junior standing in any engineering or physical science major.

Multidisciplinary investigation of automotive renewable fuels and electric/hybrid vehicles. Analyze and design related technologies and systems. Methods for complete-cycle energy and GHG analysis. Comparative emissions, efficiency, power output, and infrastructure requirements. Laboratory projects converting engines and vehicles to operate on alternative fuels or electric propulsion. 3 lectures, 1 laboratory. Crosslisted as BRAE/EE 434.

BRAE 435. Drainage. 4 units

Term Typically Offered: W

Prerequisite: BRAE 312 or BRAE 340; or graduate standing.

Relevant principles of hydrology and porous media flow. Flow nets, wells and ground water, design of simple surface and sub-surface drains. 3 lectures, 1 laboratory.

BRAE 438. Drip/Micro Irrigation. 4 units

Term Typically Offered: W

Prerequisite: BRAE 236 or BRAE 340; or graduate standing.

Drip/micro irrigation hardware and management. Emphasizes agricultural drip/micro irrigation with some landscape application. Filtration, emitters, chemical injection, agronomic constraints, and scheduling. Field trip(s) included. 3 lectures, 1 laboratory.

BRAE 440. Agricultural Irrigation Systems. 4 units

Term Typically Offered: SP

Prerequisite: BRAE 340 or graduate standing.

On-farm irrigation system evaluation and management. Drip, micro-spray, furrow, border strip, sprinkler systems. Irrigation efficiency and uniformity. Pumping costs. For non-BRAE majors only. 3 lectures, 1 laboratory.

BRAE 447. Advanced Surveying with GIS Applications. 4 units

Term Typically Offered: SP

Prerequisite: BRAE 239.

Collecting field data; processing the data; generating graphical representation of the data; design based on the data and laying out the design in the field; and available record resources for use in GIS systems and their accuracy. 2 lectures, 2 laboratories.

BRAE 448. Bioconversion. 4 units

Term Typically Offered: F

Prerequisite: MATH 118 or equivalent.

Biological, thermal and physical techniques for converting biomass into useful energy forms for agriculture and industry. Laboratory exercises include experiments with anaerobic digestion of animal wastes into methane, ethanol fermentation of grains and composting of agricultural residues. Technical and economic feasibility of biofuels. 3 lectures, 1 laboratory.

BRAE 450. Solar Photovoltaic System Engineering. 4 units

Term Typically Offered: SP

Prerequisite: one of the following: PHYS 104; PHYS 118; PHYS 121; or PHYS 141; and junior standing.

Engineering principles, design, and installation of solar photovoltaic power systems including grid-tie and off-grid systems. Photonic energy conversion, solar module engineering, solar power electronics, photovoltaic site planning, mechanical and structural considerations, permit processes, government incentives, and analysis of financial and investment issues. Field trips required. 3 lectures, 1 laboratory. Crosslisted as BRAE/EE/HNRS 450.

BRAE 460. Senior Project Organization. 1 unit

Term Typically Offered: F

Prerequisite: Completion of GE Area A3 with a grade of C- or better.

Selection and organization of senior project. Involves time management, research techniques, budgeting and project presentation. Documentation of multidisciplinary team experience. 1 lecture.

BRAE 461. Senior Project I. 2 units

Term Typically Offered: SP

Prerequisite: BRAE 460.

Solution of an engineering or systems management problem in agriculture. May involve research methodology, problem statement, analysis, synthesis, project design, construction, and evaluation. Project requires 150 hours with a minimum of faculty supervision.

BRAE 462. Senior Project II. 2 units

Term Typically Offered: TBD

Prerequisite: BRAE 461.

Solution of an engineering or systems management problem in agriculture. May involve research methodology, problem statement, analysis, synthesis, project design, construction, and evaluation. Project requires 150 hours with a minimum of faculty supervision.

BRAE 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 lectures.

BRAE 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

BRAE 481. Advanced Agricultural Mechanics. 2 units

Term Typically Offered: W

Prerequisite: Agricultural teacher candidates starting/returning from student teaching, senior or graduate standing or consent of instructor.

Advanced shop skills. Carpentry, electricity, plumbing, surveying, power mechanics, tractor equipment operation and maintenance. 1 lecture, 1 laboratory.

BRAE 485. Cooperative Education Experience in BioResource and Agricultural Engineering. 6 units

CR/NC

Term Typically Offered: SP

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience with an approved BioResource and Agricultural Engineering firm engaged in production or related business, industry or governmental agency. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only.

BRAE 495. Cooperative Education Experience in BioResource and Agricultural Engineering. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Full time work experience with an approved BioResource and Agricultural Engineering firm engaged in production or related business, industry or governmental agency. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only.

BRAE 500. Individual Study. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Total credit limited to 6 units, repeatable in same term.

BRAE 532. Water Wells and Pumps. 4 units

Term Typically Offered: SP

Prerequisite: BRAE 312 or BRAE 340 or CE 336 or ME 341.

Water well drilling, design, and development. Pump characteristics and system head. Series and parallel operation. Design of pump intakes. Variable speed electric drives and engines. Pump testing. 3 lectures, 1 laboratory.

BRAE 533. Irrigation Project Design. 4 units

Term Typically Offered: W

Prerequisite: BRAE 340 or BRAE 312 or equivalent (hydraulics/fluid mechanics course).

Engineering solutions and social aspects of improved water delivery to farms and canal automation. Flow measurement. Water user associations. Unsteady canal and pipeline controls. PID controls and modeling. 3 lectures, 1 laboratory.

BRAE 570. Selected Advanced Topics in BioResource and Agricultural Engineering. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 1 to 4 seminars.

BRAE 571. Selected Advanced Laboratory in Bioresources and Agricultural Engineering. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

BRAE 599. Thesis in BioResource and Agricultural Engineering. 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor.

Systematic research of a significant problem in bioresource and agricultural engineering. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units.

Biology (BIO)

BIO Courses

BIO 111. General Biology. 4 units

GE Area B2; GE Area B4

Term Typically Offered: F,W,SP,SU

Principles of cellular biology, heredity, ecology, biological diversity, and evolution, with emphasis on their relationships to human affairs. Not open for major credit in Biological Sciences, Microbiology or Marine Sciences. Not open to students who have completed BIO 115 or BIO 161. 3 lectures, 1 laboratory. Fulfills GE B2 & B4.

BIO 112. Environmental Biology and Conservation. 4 units

GE Area B5

Term Typically Offered: F, SP

A biologically centered exploration of our planet focusing on natural resource conservation and contemporary environmental issues. Interactions between components of the biosphere and impacts of human society on interrelationships within ecosystems. Trends in natural resource conservation and biodiversity preservation. Not open for major credit in Biological Sciences, Microbiology, or Marine Sciences. 4 lectures. Fulfills GE B5.

BIO 114. Plant Diversity and Ecology. 4 units

GE Area B2; GE Area B4

Term Typically Offered: W, SP

Plant diversity and ecology in aquatic and terrestrial plant communities including adaptations of plants to their environment. Identification of common, local native plants and plant communities, uses of native plants by Native Americans, and human impacts on native plant communities. 2 lectures, 2 laboratories. Fulfills GE B2 & B4.

BIO 123. Biology of Sex. 4 units

GE Area B2

Term Typically Offered: W

Fundamental principles of biology related to sexual reproduction: genetics, physiology, behavior, ecology and evolution of sex in a broad range of organisms. 4 lectures. Not open for major credit in Biological Sciences, Microbiology, or Marine Sciences. Fulfills GE B2.

BIO 160. Diversity and History of Life. 4 units

Term Typically Offered: F, W

Overview of the history, diversity and genetic relatedness of life on Earth; broad-scale evolutionary framework of the organization and expansion of life on Earth. 3 lectures, 1 laboratory.

BIO 161. Introduction to Cell and Molecular Biology. 4 units

GE Area B2; GE Area B4

Term Typically Offered: F,W,SP,SU

Recommended: CHEM 110 or CHEM 111 or CHEM 124 or CHEM 127.

Fundamentals of cellular biology with an emphasis on the molecular perspective of life: metabolism, photosynthesis, cell structure and reproduction, meiosis, immunology, classical and molecular genetics, gene regulation. 3 lectures, 1 laboratory. Fulfills GE B2 & B4.

BIO 162. Introduction to Organismal Form and Function. 4 units

Term Typically Offered: W, SP

Prerequisite: BIO 161. Recommended: CHEM 110 or CHEM 111 or CHEM 124 or CHEM 127.

Fundamentals of the structure and physiology of tissues and organs of plants and animals: energy acquisition and food distribution, gas exchange and fluid transport, and sensing and responding to the environment. 3 lectures, 1 laboratory.

BIO 200. Special Problems for Undergraduates. 1-2 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of department chair.

Individual investigation, research, studies or surveys of selected problems. Intended for lower division students in the Biological Sciences Department. Total credit limited to 12 units, with a maximum of 2 units per quarter. Credit/No Credit grading only.

BIO 202. Orientation to Biotechnology. 2 units

Term Typically Offered: W, SP

Prerequisite: Completion of a course with a BIO, BOT or MCRO prefix and a course with a CHEM prefix.

Introduction to the diversity of fields in biotechnology. Applications in agriculture, nutrition, medicine and environmental problems. 1 lecture, 1 activity. Crosslisted as BIO/CHEM 202.

BIO 211. Biology of Plants and Animals. 4 units

Term Typically Offered: W, SP

Prerequisite: BIO 111; for Liberal Studies majors only. Recommended: STAT 130 or STAT 217.

Plant and animal anatomy, physiology, diversity and life cycles. How plants and animals acquire nutrients, reproduce, and adapt to environments. Emphasis on hands-on activities and model organisms suited for the elementary classroom. 3 lectures, 1 laboratory. Not open for major credit in Biological Sciences, Microbiology, or Marine Sciences.

BIO 213. Life Science for Engineers. 2 units

GE Area B2

Term Typically Offered: F, W, SP

Prerequisite: MATH 142; for engineering students only. Corequisite: BMED/BRAE 213. Recommended: CHEM 124.

Fundamentals of life sciences: energetics, cell biology, molecular and classical genetics, microbiology, organismal biology, and ecology. 2 lectures. Not open for major credit in Biological Sciences, Microbiology, or Marine Sciences. Fulfills GE B2.

BIO 227. Wildlife Conservation Biology. 4 units

GE Area B2

Term Typically Offered: F,W,SP,SU

Historical development of wildlife biology and philosophies. Basic principles of ecology and evolution. Practices applied to wildlife. Current problems involving people-wildlife interactions with special reference to world biodiversity. Not open for major credit in Biological Sciences, Microbiology, or Marine Sciences. 4 lectures. Fulfills GE B2.

BIO 231. Human Anatomy and Physiology I. 5 units

Term Typically Offered: F,W,SP,SU

Prerequisite: BIO 111 or BIO 161; CHEM 110, CHEM 111, CHEM 124, CHEM 127, or PSC 102.

Structure and function of the skeletal, muscular, nervous, endocrine, and integumentary systems. Molecular, cellular, and organ system levels of organization. Lab includes study of prosected human cadavers. Not open for major credit to Biological Sciences majors. Not open to students with credit in BIO 432 or ZOO 331. 4 lectures, 1 laboratory.

BIO 232. Human Anatomy and Physiology II. 5 units

Term Typically Offered: F,W,SP,SU

Prerequisite: BIO 111 or BIO 161; CHEM 110, CHEM 111, CHEM 124, CHEM 127, or PSC 102.

Structure and function of the circulatory, immune, respiratory, digestive, urinary, and reproductive systems. Molecular, cellular, and organ system levels of organization. Lab includes study of prosected human cadavers. Not open for major credit to Biological Sciences majors. Not open to students with credit in BIO 433 or ZOO 332. 4 lectures, 1 laboratory.

BIO 253. Health Professions Shadowing. 1 unit

CR/NC

Term Typically Offered: F, SP

Prerequisite: Consent of instructor.

Observation in a healthcare setting. Students will shadow healthcare practitioners on campus or in a community setting. Specific placement depend on practitioner availability. Total credit limited to 2 units with a maximum of 1 unit per quarter. Credit/No Credit grading only. 1 activity. Priority to BIO and MCRO majors.

BIO 263. Introductory Ecology and Evolution. 4 units

Term Typically Offered: F, SP

Prerequisite: BIO 160 or BIO 161.

Basic concepts in ecology and evolution. Relationships among organisms in populations, communities and ecosystems, structures and dynamics of populations, communities and ecosystems, ecosystem inputs and energy flows, nutrient cycling, biogeography, population genetics, evolution, patterns of biodiversity and issues in conservation biology. 3 lectures, 1 laboratory.

BIO 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

BIO 301. Service Learning in the Health Professions. 3 units

Term Typically Offered: W

Prerequisite: BIO 161 or MCRO 221 or MCRO 224; Completion of GE Area A with a grade of C- or better; GE Area D3; and consent of instructor.

Framework for understanding the implications of service in different health-related settings through discussion and participation in a local service project. Social determinants of health, cultural competency and unconscious bias, identity/intersectionality, and health needs of different populations. 2 lectures, 1 laboratory.

BIO 302. Human Genetics. 4 units

GE Area B5

Term Typically Offered: F, W, SP

Prerequisite: ASCI 112, BIO 111, BIO 123, BIO 161, BIO 213, or BOT 121. Recommended: STAT 217 or STAT 218.

Basic principles of human inheritance, including the transmission of genetic traits, chromosomal abnormalities and their effects, gene structure and function, mutations and mutagenic agents, cancer genetics, population genetics, and principles of genetic counseling. Not open for major credit in Biological Sciences, Microbiology, or Marine Sciences. Not open to students with credit in BIO 303 or BIO 351. 4 lectures. Fulfills GE B5.

BIO 303. Survey of Genetics. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 111 or BIO 161 or BOT 121. Recommended: STAT 218.

Principles of heredity and variation. Transmission genetics; molecular mechanisms of inheritance and gene expression. Not open for major credit in Biological Sciences, Microbiology, or Marine Sciences. Not open to students with credit in BIO 351. Credit will be granted in only one of the following courses: BIO 302 or BIO 303. 4 lectures.

BIO 305. Biology of Cancer. 4 units

GE Area B5

Term Typically Offered: TBD

Prerequisite: Completion of GE Area B2.

Introduction to the causes, characteristics and treatment of human cancer. Topics include effects of carcinogens and radiation; the genetics of cancer; molecular, cellular and physiological changes in common cancers; conventional chemotherapy and new treatments. Not open for major credit in Biological Sciences, Microbiology, Marine Sciences, or Biochemistry. 4 lectures. Fulfills GE B5.

BIO 308. Genetic Engineering Technology. 4 units

GE Area F

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area B2, and one of the following: CHEM 110, 111, 124 or 127.

Introduction to the methodology and techniques used in genetic engineering. Applications in agriculture, nutrition, medicine and environmental problems. Potential benefits and problems, including the underlying ethical questions. Not open to students with credit in CHEM 373, or to Biological Sciences, Marine Sciences, or Microbiology majors. 4 lectures. Crosslisted as BIO/CHEM 308. Fulfills GE Area F.

BIO 321. Mammalogy. 4 units

Term Typically Offered: F, W

Prerequisite: BIO 162 or BIO 263 or BIO 427 or ASCI 329.

Ecology, behavior, physiology, functional morphology, and evolution of mammals. Classification and identification of mammals, with emphasis on California species. 2 lectures, 2 laboratories. Formerly ZOO 321.

BIO 322. Ichthyology. 4 units

Term Typically Offered: TBD

Prerequisite: BIO 162.

Phylogeny, anatomy, functional morphology, physiology, and ecology of marine and freshwater fishes. Special reference to local and economically important species. Laboratory emphasis on taxonomy of California species, especially marine groups. 2 lectures, 2 laboratories. Formerly ZOO 322.

BIO 323. Ornithology. 4 units

Term Typically Offered: SP

Prerequisite: BIO 162 or BIO 263 or BIO 427 or ASCI 329.

Classification and identification of birds, with emphasis on California species. Functional morphology, physiology, ecology, behavior and census methods. Field trips may require meeting in the morning before scheduled lab time. 2 lectures, 2 laboratories. Formerly ZOO 323.

BIO 324. Herpetology. 4 units

Term Typically Offered: SP, SU

Prerequisite: BIO 160 and BIO 162.

Living and extinct reptiles and amphibians; an adaptive approach to their diversity, biology, and classification. 2 lectures, 2 laboratories. Formerly ZOO 341.

BIO 327. Wildlife Ecology. 4 units

Term Typically Offered: SP

Prerequisite: BIO 263 or NR 306. Recommended: STAT 217 or STAT 218.

Principles of ecology as applied to the study of wild vertebrates and their habitats. Emphasis on techniques for collecting and analyzing field data and how these data apply to the study and management of wildlife. Use of the literature, inventory of plants and animal populations, use of maps and databases, quantifying diet and habitat use, determining sex and age and nutritional condition, capture and marking techniques, non-invasive sampling methods. 3 lectures, 1 laboratory.

BIO 329. Vertebrate Field Zoology. 4 units

Term Typically Offered: SU

Prerequisite: Junior standing; BIO 162 or BIO 263 or BIO 427 or ASCI 329.

Identification and natural history of terrestrial vertebrates, with emphasis on field studies and local species. Field trips may require meeting in the morning before scheduled lab time. 2 lectures, 2 laboratories. Formerly ZOO 329.

BIO 330. Extended Field Biology Activity. 1-3 units

Term Typically Offered: TBD

Corequisite: Enrollment in corresponding field biology course.

Minimum of two days of field instruction in places with significant biological diversity, and an individual or group project. Focus on field notebooks, field identification, survey methods, experimental design, and significant habitat types for various groups of organisms. The Schedule of Classes will list the title of the associated field biology course. Total credit limited to 6 units, each associated with a different field biology course, with no more than 4 units applied as advisor approved electives. Field trip required. 1-3 activities.

BIO 335. General Entomology. 4 units

Term Typically Offered: TBD

Prerequisite: AEPS 313, BIO 160, or BIO 211. Recommended: BIO 162.

Introduction to the study of insects. Structure, major orders and families of insects, life histories, medical, and economic importance. Insect collection required. 2 lectures, 2 laboratories. Formerly ZOO 335.

BIO 336. Invertebrate Zoology. 4 units

Term Typically Offered: W

Prerequisite: BIO 160 and BIO 162.

Invertebrate groups of animals with emphasis on taxonomy, morphology, distribution, and economic importance. 2 lectures, 2 laboratories, and fieldwork. Formerly ZOO 336.

BIO 351. Principles of Genetics. 5 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 161; CHEM 216, CHEM 312, or CHEM 316.

Recommended: BIO 263; STAT 217 or STAT 218.

Principles of genetics and genetic analysis, including underlying molecular mechanisms. Subjects include gene structure and function, inheritance patterns, regulation of gene expression, mutation, recombination, recombinant DNA technology, and an introduction to population genetics. 5 lectures.

BIO 361. Principles of Animal Physiology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 162; and CHEM 216, CHEM 312 or CHEM 316.

Fundamental principles of animal physiology, including cellular mechanisms and integration to whole animals. Membrane transport, fluid/salt balance, excitable cells, metabolic rate, temperature, gas exchange and circulation. 3 lectures, 1 laboratory.

BIO 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total major credit limited to 6 units, with a maximum of 2 units per quarter. Total credit limited to 12 units.

BIO 401. Principles of Conservation Biology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 263 or NR 306, or graduate standing in Biological Sciences.

Foundational concepts in the conservation of wild organisms and their habitats. Quantification and valuation of biological diversity, current threats to diversity, and approaches to better understand and address these threats, across terrestrial, freshwater, and marine environments. 4 lectures.

BIO 405. Developmental Biology. 4 units

Term Typically Offered: TBD

Prerequisite: BIO 161, BIO 162, and BIO 303 or BIO 351 or CHEM 373.

Events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation, and organogenesis, with emphasis on differential gene expression in model organisms. 3 lectures, 1 laboratory.

BIO 406. Advanced Anatomy and Physiology: Neuroscience. 4 units

Term Typically Offered: F, W

Prerequisite: BIO 361; CHEM 331 or STAT 218; PHYS 123 or PHYS 133; or graduate standing in Biological Sciences.

Anatomy and physiology of nervous systems including electrophysiology, molecular and cellular mechanisms of neurotransmission, interactions between the nervous system and other body systems, and comparative anatomy of vertebrate nervous systems, especially humans. 3 lectures, 1 laboratory.

BIO 407. Advanced Anatomy and Physiology: Endocrinology. 4 units

Term Typically Offered: F, SP

Prerequisite: BIO 361; CHEM 331 or STAT 218; or graduate standing in Biological Sciences.

Anatomy and physiology of the endocrine system and hormones, with an emphasis on humans and other vertebrates. 4 lectures.

BIO 408. Advanced Anatomy and Physiology: Cardiorespiratory and Renal. 4 units

Term Typically Offered: F, W

Prerequisite: BIO 361; CHEM 331 or STAT 218; or graduate standing in Biological Sciences.

Anatomy and physiology of the cardiovascular, respiratory, and renal systems, with an emphasis on humans and other vertebrates. Discussion of health and disease states and responses to exercise and environmental factors. 3 lectures, 1 laboratory.

BIO 409. Advanced Anatomy and Physiology: Muscle and Locomotion. 4 units

Term Typically Offered: W, SP

Prerequisite: BIO 361; CHEM 331 or STAT 218; PHYS 121 or PHYS 141; or graduate standing in Biological Sciences.

Anatomy and physiology of musculoskeletal systems, including energetics and biomechanics of locomotion. Discussion of invertebrates and vertebrates with emphasis on humans. 3 lectures, 1 laboratory.

BIO 410. Functional Histology. 4 units

Term Typically Offered: SP

Prerequisite: ASCI 229 or BIO 231 or BIO 232 or BIO 361 or graduate standing in Biological Sciences.

Functional microscopic anatomy of principal tissues and organs of vertebrates, including humans. Structural studies to determine mechanisms underlying physiological processes and their clinical applications in medicine. 2 lectures, 2 laboratories.

BIO 414. Evolution. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: BIO 263; and BIO 303 or BIO 351. Recommended: BIO 327 or BOT 326 or MSCI 328.

Scientific evaluation of the theories, mechanism, and patterns of biological evolution. 4 lectures.

BIO 415. Biogeography. 4 units

Term Typically Offered: F

Prerequisite: BIO 263, or graduate standing in Biological Sciences.

Plant and animal distribution patterns in relation to past and present physical and biotic factors; survey of major biomes with major emphasis on North and South America. 4 lectures.

BIO 419. Analytical Methods in Ecology. 4 units

Term Typically Offered: TBD

Prerequisite: STAT 218 or graduate standing in Biological Sciences.

Recommended: one of the following: BIO 263, BIO 327, BOT 326, MSCI 328 or NR 306.

Introduction to quantitative methods used in ecology with an emphasis on the design and analysis of field studies. Population estimates, sampling design and analysis, and the determination of community structure. 3 seminars, 1 activity.

BIO 421. Wetlands. 4 units

Term Typically Offered: TBD

Prerequisite: BOT 121 or BIO 162, CHEM 111 or CHEM 127, and SS 121 or SS 131. Recommended: one of the following: BIO 327, BOT 313, BOT 326, MSCI 328 or NR 306.

The formation, characteristics, and functions of wetlands. Genesis of hydric soils. Plant adaptations to saturated soils. Wetlands as wildlife habitat. Policies and social issues associated with wetlands. The procedures of wetland delineations. 3 lectures, 1 laboratory. Crosslisted as BIO/NR/SS 421.

BIO 424. Organizing and Teaching Science. 4 units

Term Typically Offered: TBD

Prerequisite: Admission to the Single Subject Credential Program.

Techniques, aims and objectives in the teaching of physical and life sciences at the secondary level. Selection and organization of teaching material, including strategies for English language learners (ELL) and special needs students. Evaluation of results. 3 lectures, 1 activity. Crosslisted as BIO/PSC 424.

BIO 425. Clinical Experience in Teaching Science Seminar. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Acceptance into the Single Subject Credential Program in Science. Concurrent: EDUC 469 or EDUC 479.

Principles and practices in effective teaching of science at the middle and high school level, learning theories, curriculum content and structure, classroom issues, and the teaching profession. Credit/No Credit grading only. Total credit limited to 4 units. 2 seminars. Crosslisted as BIO/PSC 425.

BIO 426. Immunology. 4 units

Term Typically Offered: W, SP

Prerequisite: BIO 351 or CHEM 373. Recommended: CHEM 313 or CHEM 371.

Principles of molecular and cellular immunology. Emphasis on molecular regulation of immune cell development, including generation of unique receptors, lymphocyte signal transduction and selection, programmed cell death and regulation of immune responses. Discussion and demonstration of roles of immunology in disease and as diagnostic tools. 3 lectures, 1 laboratory.

BIO 427. Wildlife Management. 4 units

Term Typically Offered: W

Prerequisite: One of the following upper-division ecology courses: BIO 327, BIO 401, BIO 444, BOT 326, MSCI 328, or NR 306, or graduate standing in Biological Sciences.

Important habitats, such as riparian, wetlands, and habitat features important to wildlife, such as vegetation types and snags. Basic concepts of wildlife management. Emphasis on planning and designing habitats to meet the needs of wildlife. 3 lectures, 1 laboratory.

BIO 428. Hematology. 4 units

Term Typically Offered: SP, SU

Prerequisite: BIO 351 or BIO 302 or BIO 303 or CHEM 373, or graduate standing in Biological Sciences. Recommended: BIO 361 or ZOO 332 or BMED 460; CHEM 313 or CHEM 371.

Development and function of blood as a tissue. Composition, function, and mechanisms of formation and destruction of blood components in health and disease. Methods for examination of blood. 3 lectures, 1 laboratory. Formerly ZOO 428.

BIO 429. Parasitology. 4 units

Term Typically Offered: TBD

Prerequisite: BIO 160 and BIO 161, or MCRO 221, or MCRO 224, or graduate standing in Biological Sciences.

External and internal parasites of man and animals. Life history. Parasite-host relationships. Control and recognition of species of clinical importance. 2 lectures, 2 laboratories. Formerly ZOO 425.

BIO 434. Environmental Physiology. 4 units

Term Typically Offered: W

Prerequisite: BIO 162, or graduate standing in Biological Sciences. Recommended: BIO 263.

Comparative physiological mechanisms involved in the regulation of oxygen uptake, water and ion balance, and temperature regulation in animals. Emphasis is placed on physiological adaptations which maintain or restore homeostasis in animals which are subjected to environmental changes. 3 lectures, 1 laboratory.

BIO 435. Plant Physiology. 4 units

Term Typically Offered: W

Prerequisite: BOT 121 or BIO 162. Recommended: BIO 161 or BIO 303; CHEM 312 or CHEM 216.

Consideration of the principal physiological and biochemical processes of plants with emphasis on water relations, mineral nutrition, photosynthesis, and the physiology of plant development. 3 lectures, 1 laboratory.

BIO 441. Bioinformatics Applications. 4 units

Term Typically Offered: F, SP

Prerequisite: Junior standing; BIO 161 or BIO 303. Recommended: BIO 302 or BIO 303 or BIO 351 or CHEM 373.

Introduction to new problems in molecular biology and current computer applications for genetic database analyses. Use of software for: nucleic acid, genome and protein sequence analysis; genetic databases, database tools; industrial applications in bioinformatics; ethical and societal concerns. 3 lectures, 1 laboratory. Crosslisted as BIO/CHEM 441.

BIO 442. Behavioral Ecology. 4 units

Term Typically Offered: W

Prerequisite: BIO 263, or graduate standing in Biological Sciences.

Behavioral adaptations of animals to their environment and way of life. Analysis of behavior patterns, use of patterns in clarifying evolutionary and ecological relationships. 3 lectures, 1 laboratory.

BIO 444. Population Ecology. 4 units

Term Typically Offered: SP

Prerequisite: BIO 263 or NR 306.

Growth, fluctuations, balance, and natural mechanisms controlling wild populations, and methods for assessing their interconnectedness. Field trip may be required. 3 lectures, 1 laboratory.

BIO 445. Community Ecology. 4 units

Term Typically Offered: TBD

Prerequisite: BIO 160, BIO 162, BIO 263, and STAT 218 or Graduate standing in Biological Sciences. Recommended: BIO 327, BIO 401, BOT 326, or MSCI 328.

Principles of ecology at the community level including the mechanism that structure ecological communities, and the quantitative methods used to study community ecology such as diversity metrics, community composition analyses, interaction strengths and the application of statistics to field and experimental studies. 3 lectures, 1 laboratory.

BIO 446. Ecosystem Ecology. 4 units

Term Typically Offered: SP

Prerequisite: BIO 263, BOT 326, or NR 306; and STAT 218, or Graduate standing in Biological Sciences. Recommended: BIO 327, BIO 401, MSCI 328 or SS 121.

Advanced ecosystem ecology and biology, and the interactions of biological communities with the abiotic environment. Emphasis on climate change, ecosystem services, and major fluxes and pools of organic elements. 4 lectures.

BIO 450. Undergraduate Laboratory Assistantship. 1-4 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor and department chair.

Assisting the instructor in teaching and supervising undergraduate laboratories in the Biological Sciences Department. Total credit limited to 8 units, with a maximum of 4 units per quarter. Credit/No Credit grading only.

BIO 452. Cell Biology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 351 or CHEM 373; and CHEM 216, CHEM 312 or CHEM 316. Recommended: CHEM 313 or CHEM 371.

Introduction to cell structure and function, energy conversions, protein sorting, signaling, cytoskeleton, cell adhesion, and the cell cycle. 3 lectures, 1 laboratory.

BIO 461. Senior Project - Research Proposal. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: fulfillment of GWR, STAT 218, and junior standing.

Completion of a research proposal and literature review, including analysis of experimental results from published peer-reviewed articles in biology. Written and oral presentations. 2 activities.

BIO 462. Senior Project - Research. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: fulfillment of GWR, STAT 218, junior standing, and consent of instructor. Recommended: BIO 400.

Completion of a research project or equivalent in the biological sciences, selected and conducted in consultation with an instructor. Results are presented in written reports.

BIO 463. Honors Research. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: BIO 462 and consent of instructor.

Completion of advanced research in the biological sciences, selected and conducted in consultation with an instructor. Results presented as a written report and/or oral presentation in a public forum.

BIO 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

BIO 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topics selected. Total credit limited to 8 units. 1 to 4 laboratories.

BIO 472. Current Topics in Biological Research. 1-4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Applications of biological research topics. Discussions of how selected discoveries in biological research formed the basis for, and were developed into, practical applications, currently accepted theories, generally utilized techniques or decisions affecting society and political policies. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-4 seminars.

BIO 475. Molecular Biology Laboratory. 3 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 161, and grade of C- or better in BIO 351 or CHEM 373 or consent of instructor.

Introduction to techniques used in molecular biology and biotechnology; DNA extraction, characterization, cloning, Southern blotting, reverse transcription, polymerase chain reaction, and sequencing analysis. 1 lecture, 2 laboratories. Crosslisted as BIO/CHEM 475.

BIO 476. Gene Expression Laboratory. 3 units

Term Typically Offered: SP

Prerequisite: BIO/CHEM 475; CHEM 313 or CHEM 371, or graduate standing in Biological Sciences.

Heterologous gene expression of a recombinant protein in a microbial system: gene cloning, construction of expression plasmid, DNA sequence analysis, transformation of microbial host, selection and analysis of transformed host cells, expression and purification of recombinant protein. 1 lecture, 2 laboratories. Crosslisted as BIO/CHEM 476.

BIO 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only.

BIO 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only.

BIO 500. Individual Study. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing in Biological Sciences and consent of instructor.

Advanced study planned and completed with the approval of and under the direction of a member of the department faculty. A written scholarly presentation of the results of each BIO 500 project must be included in the graduate student's departmental file. Total degree credit limited to 3 units. Total credit limited to 12 units.

BIO 501. Molecular & Cellular Biology. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

Principles of molecular and cellular biology including gene function and regulation, energetics, protein trafficking, cytoskeleton, signaling, adhesion, and the cell cycle. 3 lectures, 1 laboratory.

BIO 502. Biology of Organisms. 4 units

Term Typically Offered: W

Prerequisite: BIO 501 and graduate standing in Biological Sciences, or consent of instructor.

Principles of and current topics in organismal biology, with an emphasis on physiology (including organ systems), behavior, and responses to the environment. 3 lectures, 1 laboratory.

BIO 503. Population Biology. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

Considerations of theory and practice in population ecology, evolutionary biology, and biosystematics. 3 lectures, 1 laboratory.

BIO 509. Communicating Biology to General Audiences. 1 unit

Term Typically Offered: SP

Prerequisite: Graduate standing.

Key issues for scientists communicating with the general public. Introduction to principles, examination of case studies, and practical application in outreach projects. Intended for graduate students in biology and related disciplines. 1 activity.

BIO 524. Developmental Biology Seminar. 2 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in Biological Sciences or consent of instructor. Recommended: BIO 501.

Principles and selected topics in developmental biology. Issues of differentiation, morphogenesis, and pattern formation; specific topics chosen by participants. 2 seminars.

BIO 534. Principles of Stem Cell Biology. 2 units

Term Typically Offered: F

Prerequisite: Graduate standing in Biological Sciences, Biomedical Engineering, or Agriculture, or consent of instructor. Recommended: BIO 452 or BIO 501.

Principles of stem cell biology including characteristics, types, roles in development, therapeutic uses, historical perspectives and ethical issues. 2 seminars.

BIO 537. Advanced Behavioral Ecology. 1 unit

Term Typically Offered: TBD

Prerequisite: BIO 442, or graduate standing.

Function and evolution of behavioral traits as they relate to ecological phenomena. Habitat selection, migration, spacing mechanisms, reproductive strategies, feeding strategies, agonistic, parasitic, altruistic behavior, communication, and comparative social systems. 1 activity.

BIO 561. Proposal Writing for Biological Research. 3 units

Term Typically Offered: W

Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

Written and oral presentations of a proposal for research in biology including a literature review. 3 seminars.

BIO 570. Selected Topics in Biology. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

Directed group study of selected topics for graduate students. Class Schedule will list topics for selection. Total credit limited to 12 units. 1 to 4 seminars.

BIO 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

BIO 574. Teaching Strategies for College Biology Laboratories. 1 unit
CR/NC

Term Typically Offered: F

Prerequisite: Graduate standing in Biological Sciences.

Concepts of teaching and learning related to instructor performance in college biology laboratory classes. Introduction to teaching strategies, managing a classroom, writing exam questions, and science education research for the laboratory class setting. Credit/No Credit grading only. 1 activity.

BIO 575. College Biology Teaching Practicum. 1-2 units
CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and evidence of satisfactory preparation in biology; Department chair and graduate coordinator's approval required.

Part-time teaching assignment in an undergraduate college classroom. Includes teaching and related activities under the supervision of a professor in Biological Science. Total credit limited to 2 units. Credit/No Credit grading only. 1-2 activities.

BIO 585. Cooperative Education Experience. 6 units
CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing in Biological Sciences and consent of instructor.

Advanced study, analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 6 units. Credit/No Credit grading only.

BIO 590. Seminar in Biology. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing in Biological Sciences or consent of instructor.

Problems and topics in advanced biology selected according to the interest and needs of the students enrolled. Total credit limited to 6 units. 1 activity.

BIO 591. Trends in Biology. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing in Biological Sciences.

Recent trends in the field of biology for graduate students in the Biological Sciences master's degree program. Overview of current research with presentations from visiting scholars and Cal Poly faculty. Total credit limited to 3 units. 1 activity.

BIO 593. Regenerative Medicine Internship. 3-5 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing in the Specialization in Regenerative Medicine for the MS in Biological Sciences; or the Specialization in Regenerative Medicine for the MS in Biomedical Engineering; or the Specialization in Animal Science for the MS in Agriculture.

Supervised graduate research and/or development in stem cell science or regenerative medicine and engineering. Provides students with an off-campus industrial or university internship. Total credit limited to 10 units. Crosslisted as ASCI/BIO/BMED 593.

BIO 594. Applications in Regenerative Medicine. 2 units

Term Typically Offered: SP

Prerequisite: Graduate standing in the Specialization in Regenerative Medicine for the MS in Biological Sciences, or the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture.

Transfer of skills and knowledge gained through coursework, in an applied setting at Cal Poly. Demonstration of technical, problem solving, and presentation skills, and familiarity with current research. Part of the culminating experience for the Specialization in Regenerative Medicine in the MS in Biological Sciences, or the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture. 1 seminar and supervised work. Crosslisted as ASCI/BIO/BMED 594.

BIO 595. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing in Biological Sciences and consent of instructor.

Advanced study, analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 12 units. Credit/No Credit grading only.

BIO 599. Thesis. 1-3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing in Biological Sciences and consent of instructor.

Individual research under the general supervision of the faculty, leading to a graduate thesis of suitable quality. Total credit limited to 9 units.

Biomedical Engineering (BMED)

BMED Courses

BMED 101. Introduction to the Biomedical Engineering Major. 1 unit

Term Typically Offered: F

Prerequisite: Biomedical or General Engineering Freshmen.

Introduction to major topics in Biomedical Engineering. Time management, study skills and class scheduling necessary for academic success. Overview of university services. Professional pathways and ethics. Review of career opportunities. 1 seminar.

BMED 102. Introduction to Biomedical Engineering Analysis. 1 unit

Term Typically Offered: W

Prerequisite: BMED 101 and MATH 141.

General introduction to bioengineering analysis applied to representative topics in biomechanics, biofluidics, bioinstrumentation, biomaterials, biotechnology, and related areas. Review of technological needs, testing procedures, governmental regulation, quality of life, and ethical issues. 1 seminar.

BMED 212. Introduction to Biomedical Engineering Design. 3 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 143.

General introduction to bioengineering design, including examples of engineering analysis and design applied to representative topics in biomechanics, bioinstrumentation, biomaterials, biotechnology, and related areas. A review of technological needs, design methodology, testing procedures, statistical analysis, governmental regulations, evaluation of costs and benefits, quality of life, and ethical issues. 2 lectures, 1 laboratory.

BMED 213. Bioengineering Fundamentals. 2 units

GE Area B2

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 142; for engineering students only. Corequisite: BIO 213. Recommended: CHEM 124.

Treatment of the engineering applications of biology. Genetic engineering and the industrial application of microbiology. Systems physiology with engineering applications. Structure and function relationships in biological systems. The impact of life on its environment. Course may be offered in classroom-based or online format. 2 lectures. Crosslisted as BMED/BRAE 213. Fulfills GE B2.

BMED 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

BMED 310. Biomedical Engineering Measurement and Analysis. 4 units

Term Typically Offered: F, W

Prerequisite: EE 201; and CPE/CSC 101, CSC 231, CSC 232, or CSC 234.

Fundamentals of biomedical engineering analysis. Use and application of tools and analytical methods used by bioengineers. 3 lectures, 1 laboratory.

BMED 330. Intermediate Biomedical Design. 4 units

Term Typically Offered: SP

Prerequisite: MATE 210, ME 328, STAT 312. Recommended: BMED 420, BMED 460.

Design of biomedical devices and systems using various machine elements and components including gears, welded connections, prime movers. Decision modeling based on technical and economic feasibility. 3 lectures, 1 laboratory.

BMED 355. Electrical Engineering Concepts for Biomedical Engineering. 4 units

Term Typically Offered: W

Prerequisite: EE 201, MATH 344.

Introduction to electrical engineering concepts for biomedical engineers. Continuation of basic circuit analysis. Steady state AC circuit analysis and phasor concepts. Application of the Laplace Transform to transient circuit analysis. Introduction to digital logic gates, combinational and sequential logic circuits. 4 lectures.

BMED 400. Special Problems for Advanced Undergraduates. 2-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: ME 212; junior standing; and consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total degree credit limited to 4 units. Total credit limited to 6 units.

BMED 401. Biomedical Entrepreneurship. 4 units

Term Typically Offered: SP

Prerequisite: Senior standing and engineering major.

Identification and evaluation of commercial opportunities in the healthcare industry. Methods necessary for rapid iteration and market validation of early-stage prototypes, with emphasis on issues critical to biomedical products, including intellectual property, FDA submission, funding sources, and business models. 3 lectures, 1 laboratory.

BMED 404. Applied Finite Element Analysis. 4 units

Term Typically Offered: F, W

Prerequisite: BMED 410 and CE 207; or CE 406; or ME 328.

Finite element based solutions to engineering problems with an emphasis on elastostatic problems in structural mechanics. The power and pitfalls associated with the finite element method highlighted through practical modeling assignments. Introduces the use of commercial finite element codes. 3 lectures, 1 laboratory. Crosslisted as BMED/CE/ME 404.

BMED 409. Interdisciplinary Study in Biomechanics. 4 units

Term Typically Offered: F

Prerequisite: KINE 403; or ME 326.

Examination of human motion biomechanics. Experimental and analytical methods in motion analysis based on rigid body dynamics. Protocols for protection of human subjects in research. Hypothesis-driven research in interdisciplinary teams, including written proposal development and written/oral communication of results to a scientific audience. 1 lecture, 3 activities. Crosslisted as BMED/KINE/ME 409.

BMED 410. Biomechanics. 4 units

Term Typically Offered: W, SP

Prerequisite: CE 204 and ME 212. Corequisite: BMED 310.

Introduction to physiological systems, with emphasis on structure and function of major tissues and organs. Application of mechanics to understand the behavior of these tissues and organs at gross and microscopic levels. Bioelastic solids. Rigid body biomechanics. Biofluids, basic mechanical properties of collagen and elastin, bone, cartilage, muscles, blood vessels, and other living tissues. Application of continuum mechanics to hard and soft tissues. Biomechanical engineering design for clinical applications. 3 lectures, 1 laboratory.

BMED 420. Principles of Biomaterials Design. 4 units

Term Typically Offered: W, SP

Prerequisite: CE 204 and MATE 210. Corequisite: BMED 310.

Fundamentals of materials science as applied to bioengineering design. Biocompatibility of materials. Materials characterization and design. Natural and synthetic polymeric materials. Wound repair, foreign body response, blood clotting. Transplantation biology, artificial organs, and tissue engineering. Medical devices, government regulations, and ethical issues. 3 lectures, 1 laboratory.

BMED 422. Medical Device Evaluation and the FDA Approval Process. 4 units

Term Typically Offered: TBD

Prerequisite: BMED 420.

Overview of the path to market for new medical devices, including nonclinical and clinical evaluation and the regulatory process. Course covers bench, in vitro, and in vivo models, GLP studies, clinical trials, Quality Systems, and FDA clearance and approval processes. 4 lectures.

BMED 425. Biomedical Engineering Transport. 4 units

Term Typically Offered: F, SP

Prerequisite: ME 302 and ME 341.

Mass transfer in solids, liquids, and gases with application to biological systems. Free and facilitated diffusion. Convective mass transfer. Diffusion-reaction phenomena. Active transport. Biological mass transfer coefficients. Nonequilibrium thermodynamic analysis of transport phenomena. The osmotic effect. Diffusion and exchange in biological systems. 3 lectures, 1 laboratory.

BMED 430. Biomedical Modeling and Simulation. 2 units

Term Typically Offered: F, W

Prerequisite: BMED 310.

Computational methods for anatomical modeling and boundary value problems in the biomechanics of tissues and biomedical devices. Nonlinear biodynamics, heat flow, cardiac impulse propagation, anatomic modeling, and biomechanics. 1 lecture, 1 laboratory.

BMED 432. Micro/Nano System Design. 4 units

Term Typically Offered: F

Prerequisite: BMED 212 or MATE 210.

Fundamentals of designing micro/nano scale systems employing sensors, actuators and intelligent controls. Explore mechanics, electronics, heat transfer, photonics, fluid mechanics and biometrics at the micrometer and nanometer scale. Discover how scaling impacts design criteria. Investigate the integration of science and engineering and evaluate applications in living systems. Not open to students with credit in MATE 550. 4 lectures.

BMED 434. Micro/Nano Fabrication. 3 units

Term Typically Offered: W

Prerequisite: BMED 212 or MATE 210.

Fabrication science and technology for creating micro and nano scale devices. Explore basic processes such as oxidation, diffusion, ion implantation, etching, chemical and physical vapor deposition, photolithography. Develop an understanding of the science of each process and how to select the right steps for fabricating electronic, photon and micro-electro-mechanical systems devices. 3 lectures. Crosslisted as BMED 434/EE 423/MATE 430.

BMED 435. Microfabrication Laboratory. 1 unit

Term Typically Offered: W

Corequisite: BMED 434/EE 423/MATE 430.

Application of basic processes involved in microfabrication: cleanroom protocol, oxidation, diffusion, photolithography etching and sputtering. Explore process development through fabrication of electronic, photonic or microfluidic devices. Each student will be part of a team that will fabricate and test a device. 1 laboratory. Crosslisted as BMED/MATE 435.

BMED 436. Characterization of Micro/Nano Scale Structures. 4 units

Term Typically Offered: SP

Prerequisite: BMED 212 or MATE 210.

Fundamentals of material's surface analysis techniques for exploring structure and composition of micro/nano scale features and films will be assessed. Students will develop data analytics for deciding which technique to apply for morphological, elemental or chemical composition analysis. 4 lectures.

BMED 440. Bioelectronics and Instrumentation. 4 units

Term Typically Offered: F, W

Prerequisite: BMED 310 and EE 201.

Analog and digital circuits in bioinstrumentation. Biomedical signals in continuous and discrete systems. Sampling and digital signal processing. Ultrasound, MRI, CT, Bioelectromagnetics. Electrokinetics. Biophysical phenomena, transducers, and electronics as related to the design of biomedical instrumentation. Potentiometric and amperometric signals and amplifiers. Biopotentials, membrane potentials, chemical sensors. Mechanical transducers for displacement, force and pressure. Temperature sensors. Flow sensors. Light-based instrumentation. Electrical safety. 3 lectures, 1 laboratory.

BMED 445. Biopotential Instrumentation. 4 units

Term Typically Offered: SP

Prerequisite: BMED 440.

Focus on the principles associated with instrumentation used to detect surface biopotentials. Emphasis on circuit level design and laboratory implementation of systems used to detect ECG, EMG and EEG signals. Development of practical experience with analog electronic instrumentation used in the design and testing process. A system level design project related to surface biopotential detection and recording. 2 lectures, 2 laboratories.

BMED 450. Contemporary Issues in Biomedical Engineering. 4 units

Term Typically Offered: TBD

Prerequisite: Senior standing in Biomedical Engineering.

Current and evolving topics in biomedical engineering, including medical and industrial applications. Exploration of contemporary issues in biomedical engineering, including technical and societal implications. The Schedule of Classes will list topic selected. Total credit limited to 16 units. 4 lectures.

BMED 455. Biomedical Engineering Design I. 4 units

Term Typically Offered: F, W

Prerequisite: BMED 410.

Engineering design methodology, design process, project planning, decision making, modeling, construction, and testing of an open-ended design project. Preparation of formal engineering reports. Statistical analysis. Governmental regulations. Bioethical issues. 2 lectures, 2 laboratories.

BMED 456. Biomedical Engineering Design II: Senior Project. 4 units

Term Typically Offered: W, SP

Prerequisite: BMED 455.

Engineering design methodology, design process, project planning, decision making, modeling, construction, and testing of an open-ended design project. Preparation of formal engineering reports. Statistical analysis. Governmental regulations. Bioethical issues. 2 lectures, 2 laboratories.

BMED 459. Senior Thesis. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: senior standing, and consent of instructor.

Selection and completion of senior thesis under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Thesis results presented in a formal report. Minimum commitment of 120 hours.

BMED 460. Engineering Physiology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BMED 310 and either BIO 231 or BIO 232; or graduate standing.

Physiology for biomedical engineering students, with an emphasis on control mechanisms and engineering principles. Engineering aspects of basic cell functions; biological control systems; muscle; neural; endocrine, and circulatory systems, digestive, respiratory, renal, and reproductive systems; regulation of metabolism, and defense mechanisms. 3 lectures, 1 laboratory.

BMED 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

BMED 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

BMED 481. Senior Project Design Laboratory I. 1 unit

Term Typically Offered: TBD

Prerequisite: IME 314, MATH 244 and ME 302.

Selection and development of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 1 laboratory.

BMED 482. Senior Project Design Laboratory II. 1 unit

Term Typically Offered: TBD

Prerequisite: BMED 481.

Continuation of BMED 481. Continuation of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 1 laboratory.

BMED 483. Senior Project Design Laboratory III. 2 units

Term Typically Offered: TBD

Prerequisite: BMED 482.

Continuation of BMED 482. Continuation of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 2 laboratories.

BMED 495. Cooperative Education Experience. 1-12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A fully developed formal report and evaluation by work supervisor is required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

BMED 500. Individual Study. 2-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of department chair.

Individual investigation, research, studies or surveys of selected problems. Advanced study planned and completed under the direction of faculty. Open to graduate students who have demonstrated the ability to do independent work. Total credit limited to 8 units.

BMED 510. Principles of Tissue Engineering. 4 units

Term Typically Offered: F

Prerequisite: one of the following: ASCI 438, BIO 361, or BMED 460; or graduate standing.

Exploration of areas including cell source and isolation, scaffold selection and modification, tissue cultivation and bioreactor design, and patient implantation. Applications of tissue engineering for creating skin, cartilage, blood vessels, and other tissues. 3 lectures, 1 laboratory.

BMED 512. Biomedical Engineering Horizons. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing, MATH 143, CHEM 125, PHYS 131 or PHYS 141, BIO 161 or consent of instructor.

Examination of the advances in nanotechnology, micro-electro-mechanical systems, materials and clinical technology. Relationship between modern medical achievements and advances in engineering and science, the biomedical engineering industry, and the use of technology in a human context. 4 lectures.

BMED 515. Introduction to Biomedical Imaging. 4 units

Term Typically Offered: W

Prerequisite: PHYS 132, MATH 244, and graduate standing.

Fundamental principles and applications of biomedical imaging, modalities in medicine. Topics focus on optical imaging techniques, such as brightfield, fluorescence, confocal, multiphoton, DIC, OCT, SEM, and other advanced microscopy techniques. 2 lectures, 2 laboratories.

BMED 520. Introduction to Biomedical Engineering. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing.

Advanced treatment of the basic engineering sciences in the biomedical engineering context. For the student who has had little prior exposure to biomedical engineering, but has either a strong engineering or a strong science background. 4 lectures.

BMED 525. Skeletal Tissue Mechanics. 4 units

Term Typically Offered: W

Prerequisite: CE 204, BMED 460.

Overview of the mechanical properties of various tissues in the musculoskeletal system, the relationship of these properties to anatomic and histologic structures, and the changes in these properties caused by aging, disease, overuse, and disuse. Tissues covered include bone, cartilage and synovial fluid, ligament, and tendon. 4 lectures.

BMED 530. Biomaterials. 4 units

Term Typically Offered: F, W

Prerequisite: BIO 161, or BIO 213 and BMED/BRAE 213; MATE 210 and graduate standing or consent of instructor.

Structure-function relationships for materials in contact with biological systems. Interactions of materials implanted in the body. Histological and hematological considerations including foreign body responses, inflammation, carcinogenicity, thrombosis, hemolysis, immunogenic and toxic properties. Microbial interaction with material surfaces, degradation. 4 lectures. Crosslisted as BMED/MATE 530.

BMED 535. Bioseparations. 4 units

Term Typically Offered: W

Prerequisite: BMED 425, ME 341 or consent of instructor.

Advanced topics in physicochemical hydrodynamics, bioseparations and microfluidic bioseparations, which include the key aspects of electrokinetics, colloid science and suspension mechanics in bioseparations. Understanding key separation design parameters through theoretical and numerical models. 4 lectures.

BMED 541. Microcirculation. 3 units

Term Typically Offered: TBD

Prerequisite: BMED 460.

Topic groups include microvessel wall structure, network architecture, flow regulation, transport, inflammation, angiogenesis, arteriogenesis, and rarefaction. Additional focus on patho-physiology and the engineering approaches to assess and treat microvascular dysfunction. Not open to students with credit in BMED 540. 3 lectures.

BMED 542. Microcirculation Laboratory. 1 unit

Term Typically Offered: TBD

Prerequisite: BMED 460.

Laboratory procedures include direct visualization of microvessels by microscopy and indirect assessment by skin temperature, evaluation of microvascular networks by casting and immunostaining, and assessment of vascular wall structure by histology. 1 laboratory.

BMED 550. Current and Evolving Topics in Biomedical Engineering. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing in biomedical engineering or consent of department chair.

Current topics in biomedical engineering, including medical and industrial applications. Exploration of detailed technical treatment of contemporary issues in biomedical engineering, and examination of technical and societal implications of these subjects. The Schedule of Classes will list topics selected. Total credit limited to 8 units. 4 lectures.

BMED 555. Neural Systems Simulation and Modeling. 4 units

Term Typically Offered: SP

Prerequisite: MATH 244, BMED 440.

The biophysical basis of the Hodgkin-Huxley active membrane model. A detailed description of the dynamics of voltage gated ion channels. The complete Hodgkin-Huxley active membrane model, with an emphasis on its use in simulating the electrical activity of nerve cells. Equivalent circuit/ circuit simulator based approaches to modeling Hodgkin-Huxley neurons. 4 lectures.

BMED 560. Cell Transplantation and Biotherapeutics. 2 units

Term Typically Offered: SP

Prerequisite: ASCI 438, BIO 361, or BMED 460.

Topics include the etiology, patho-physiology, and rodent models for various forms of disease, such as inflammatory, autoimmune, and monogenic diseases, as well as nucleic acid, protein, and cellular-based therapies for these conditions. Not open to students with credit in BMED 545. 2 lectures.

BMED 561. Cell Transplantation and Biotherapeutics Laboratory. 2 units

Term Typically Offered: SP

Prerequisite: ASCI 438, BIO 361, or BMED 460; and STAT 218 or STAT 312. Corequisite: BMED 560.

Procedures include rodent handling, anesthesia, surgically modeling disease, biotherapy delivery, and visualizing/measuring therapeutic efficacy. Additional focus on experimental design, data collection, and analysis. 2 laboratories.

BMED 563. Biomedical Engineering Graduate Seminar. 2 units

Term Typically Offered: F, SP

Prerequisite: Graduate standing or consent of instructor.

Selected topics of interest to biomedical engineering and other graduate students. Open to graduate students and selected seniors. A forum to share information about research and research tools; an opportunity to discuss topics of interest with professionals in the field, academics, and other graduate students. The Schedule of Classes will list topic selected. Total credit limited to 4 units. 1 seminar, 1 laboratory.

BMED 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

BMED 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

BMED 591. Thesis Project Design Laboratory I. 2 units

Term Typically Offered: F

Prerequisite: Graduate standing.

Selection and completion of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research and may involve students from several disciplines. Formulation of outline, literature, review and project schedule. 2 laboratories.

BMED 592. Thesis Project Design Laboratory II. 2 units

Term Typically Offered: SP

Prerequisite: BMED 591 or consent of instructor.

Continuation of BMED 591. Completion of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research. Formulation of outline, literature review, and project schedule. 2 laboratories.

BMED 593. Regenerative Medicine Internship. 3-5 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing in the Specialization in Regenerative Medicine for the MS in Biological Sciences; or the Specialization in Regenerative Medicine for the MS in Biomedical Engineering; or the Specialization in Animal Science for the MS in Agriculture.

Supervised graduate research and/or development in stem cell science or regenerative medicine and engineering. Provides students with an off-campus industrial or university internship. Total credit limited to 10 units. Crosslisted as ASCI/BIO/BMED 593.

BMED 594. Applications in Regenerative Medicine. 2 units

Term Typically Offered: SP

Prerequisite: Graduate standing in the Specialization in Regenerative Medicine for the MS in Biological Sciences, or the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture.

Transfer of skills and knowledge gained through coursework, in an applied setting at Cal Poly. Demonstration of technical, problem solving, and presentation skills, and familiarity with current research. Part of the culminating experience for the Specialization in Regenerative Medicine in the MS in Biological Sciences, or the MS in Biomedical Engineering, or the Animal Science Specialization in the MS in Agriculture. 1 seminar and supervised work. Crosslisted as ASCI/BIO/BMED 594.

BMED 599. Design Project (Thesis). 1-9 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing.

Selection by individual or group, with faculty guidance and approval, of topic for independent research or investigation resulting in a thesis or project to be used to satisfy the degree requirement. An appropriate experimental or analytical thesis or project may be accepted. Total credit limited to 9 units.

Botany (BOT)

BOT Courses

BOT 121. General Botany. 4 units

GE Area B2; GE Area B4

Term Typically Offered: F,W,SP,SU

The anatomy, physiology, reproduction, and importance of plants. 3 lectures, 1 laboratory. Fulfills GE B2 & B4.

BOT 311. Plants, People and Civilization. 4 units

GE Area B5

Term Typically Offered: F

Prerequisite: One course from GE Area B2.

Human uses of plants for food, beverage, medicine, fiber, recreation, and rituals. Uses of plants by different cultures throughout the world and the social, economical, and environmental importance of plants in our lives. 3 lectures, 1 laboratory. Fulfills GE B5.

BOT 313. Taxonomy of Vascular Plants. 4 units

Term Typically Offered: W

Prerequisite: BIO 114 or BIO 162 or BOT 121.

Introduction to classification and identification of vascular plants, emphasizing major plant families; field and herbarium techniques. 2 lectures, 2 laboratories.

BOT 323. Plant Pathology. 4 units

Term Typically Offered: F, SP

Prerequisite: BIO 162 or BOT 121.

Comprehensive study of the causes and effects of disease in plants. Designed to lead to an understanding of the science and modern control methods. 2 lectures, 2 laboratories. Crosslisted as AEPS/BOT 323.

BOT 326. Plant Ecology. 4 units

Term Typically Offered: W, SU

Prerequisite: BIO 114, BIO 162, BIO 211, or BOT 121. Recommended: BIO 263 and STAT 217 or STAT 218.

Plant communities, population dynamics, and effects of the following environmental factors on plant growth and development: soil, water, temperature, light, atmosphere, topography, organisms, and fire. 3 lectures, 1 laboratory.

BOT 329. Plants, Food, and Biotechnology. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of one of the following: AEPS 120, BIO 111, BIO 114, BIO 161, or BOT 121.

Agriculture as applied biology and its impact on civilization. Application of technology to increase the efficiency of food production. Genetics and biotechnology; culminating in an assessment of genetically engineered foods, the myths, the controversy, the science. Not open to Agricultural and Environmental Plant Sciences majors. 3 lectures, 1 laboratory. Crosslisted as AEPS/BOT 329. Fulfills GE Area F.

BOT 433. Field Botany: California Plant Diversity. 5 units

Term Typically Offered: SP

Prerequisite: BOT 313, or graduate standing in Biological Sciences.

Field studies of California's diverse vegetation. Identification of plants and plant communities in the field. Factors affecting distribution and ecological relationships. California geography, geology, and evolution of California flora. Several one day field trips and three weekend trips to California's deserts and mountains. Field trips required. 3 lectures, 2 laboratories.

Business (BUS)

BUS Courses

BUS 100. Student Orientation and College Success. 2 units

CR/NC

Term Typically Offered: F

Orientation to majors, minors, and concentrations within the College. Development of a personalized four-year plan to graduation. Career exploration for future career planning and concentration selection. Skills for academic success: goal setting, time management, study skills, registration systems/strategies, adjustment to college life. Credit/No Credit grading only. 2 lectures.

BUS 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of area coordinator.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units.

BUS 205. Personal Finance. 4 units

Term Typically Offered: SU

Introduction to personal financial planning, including budgeting and savings, tax planning, insurance planning, equity and fixed income investments, and estate and retirement planning. Course offered online only. 4 lectures.

BUS 206. Business Professionalism and Career Readiness I. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Career development and preparation which includes self exploration, interpersonal communication, job functions and opportunities for different business disciplines, and formulation of career development plans. Application of technology for personal marketing plan and career development. Credit/No Credit grading only. 1 activity.

BUS 207. Legal Responsibilities of Business. 4 units

Term Typically Offered: F, W, SP

Examination of the American legal system and important legal principles for business operations, such as those involved with contracts, torts, agency, business organizations, and employment. Emphasis on how legal principles help define socially responsible conduct. Case studies. 4 lectures.

BUS 212. Financial Accounting for Nonbusiness Majors. 4 units

Term Typically Offered: F, W, SP

Introduction to financial accounting theory and practice with an emphasis on financial statement preparation and analysis. Not open to Business majors. 4 lectures.

BUS 214. Financial Accounting. 4 units

Term Typically Offered: F, W, SP

Principles of financial accounting for Business majors. The course prepares students to understand and interpret financial statement information. Financial reporting standards are explored to give students an understanding of how financial events are reflected in financial statements. 4 lectures.

BUS 215. Managerial Accounting. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Demonstrated competency in electronic spreadsheet, word processing, and presentation applications; BUS 212 or BUS 214 or equivalent.

Applications of accounting for making business decisions. Content includes planning and control issues including cost behavior, budget preparation, performance reporting; addresses social responsibility and employee motivational and behavioral considerations. Preparation of spreadsheet applications useful for decision-making. 4 lectures.

BUS 220. Business Basics for Entrepreneurs. 4 units

Term Typically Offered: F, SU

Prerequisite: Entrepreneurship minors only.

Basic business concepts for non-business major entrepreneurs, including unit economics and simple financial statements, intellectual property, entrepreneurial marketing, information technology, team management, and business ethics. 4 lectures.

BUS 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

BUS 301. Global Financial Institutions and Markets. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ECON 222.

Role of private and public financial institutions in allocating capital globally and promoting international commerce. Financial institutions covered include the FED, IMF, World Bank, investment banks and others. Detailed exploration of the history and functions of these institutions. 4 lectures.

BUS 302. International and Cross Cultural Management. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better; and completion of GE Areas C1, C2, and D1-D4.

Dimensions of culture and its variations within and across nations. Impact of culture on managing in a global context. Development of managerial competencies requisite to working in and supervising multicultural groups in international corporations. Frameworks for analyzing cultural and contextual influences on organizational behavior, culture shock and readjustment, expatriation and repatriation, cultural change and innovation, intercultural conflict, and ethical dilemmas. Case studies, behavioral simulations, self-assessments and fieldwork. 4 lectures.

BUS 303. Introduction to International Business. 4 units

Term Typically Offered: F

Prerequisite: A grade of C- or better in ECON 222.

Special terms, concepts, and institutions associated with the environment in which international companies operate. Students will be enabled to understand, analyze and offer solutions to global business problems. 4 lectures.

BUS 304. International Supply Chains. 4 units

Term Typically Offered: W

Prerequisite: Consent of instructor. Recommended: ECON 201 or ECON 221 or ECON 222.

Development of effective supply chains that cross national boundaries with specific examples of import/export between the United States and target country. Study tour to target country as an essential course activity. Pre-trip lectures, readings and assignments; on-the-road business tours, and post-trip import-export proposal. Conducted in English; no prior international business or travel experience required. Passport and Visa required. Field trip required. The Schedule of Classes will list country selected. 3 lectures, 1 activity.

BUS 306. Business Professionalism and Career Readiness II. 1 unit CR/NC

Term Typically Offered: W, SP

Prerequisite: BUS 206.

Continuation of BUS 206, with interpersonal leadership, networking, business communication, salary and benefit negotiations, and professional image management. Credit/No Credit grading only. 1 activity.

BUS 310. Introduction to Entrepreneurship. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A with a grade of C- or better.

Role and impact of entrepreneurship and technology startups; characteristics and traits of entrepreneurs; opportunity identification and assessment; frameworks for building startups; the founding team; organizational and legal issues; business and value proposition models; acquiring resources; entrepreneurial risk; realizing and harvesting value. 4 lectures. Crosslisted as BUS/ENGR 310.

BUS 311. Managing Technology in the International Legal Environment. 4 units

GE Area D5

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Areas D1 and D2.

Analysis of U.S. and international laws regarding technological innovations from economic, social and political perspectives. Copyrights, patents, trademarks, trade secrets, contracts, products liability and privacy. The Internet, computer programs and biotechnology. 4 lectures. Fulfills GE Area D5 except for Business Administration majors.

BUS 313. Customer Development. 4 units

Term Typically Offered: W

Prerequisite: Completion of GE Area A with a grade of C- or better.

Entrepreneurship minors only.

Experiential approach to understanding the customer development process, including strategies to identify and reach potential customers. Design and implementation of customer discovery, customer validation, and customer acquisition strategies. 4 lectures.

BUS 319. Accounting Information Systems. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 214 or Accounting minors with credit in AGB 214.

Comprehensive coverage of manual and computerized accounting processes and internal controls. 3 lectures, 1 activity.

BUS 320. Federal Income Taxation for Individuals. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 319.

Federal income taxation and planning for individuals. Federal role of taxation in the business decision-making process. Issues related to individual income tax preparation and introduction to basic property transactions. 4 lectures.

BUS 321. Intermediate Accounting I. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 319.

Comprehensive coverage of financial reporting issues. Covers financial statements, assets other than investments and intangibles, and liabilities. 4 lectures.

BUS 322. Intermediate Accounting II. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 321 with minimum grade of C-; Business majors must have formally declared their concentration to enroll.

Comprehensive coverage of financial reporting issues. Covers investments, intangibles, equities, revenue recognition and the Cash Flows Statement. 4 lectures.

BUS 323. Intermediate Accounting III. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 322.

Detailed examination of the technical and theoretical aspects of accounting for leases, pensions, income taxes, accounting changes and errors, and consolidated financial reporting. 4 lectures.

BUS 342. Fundamentals of Corporate Finance. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 214 with a grade of C- or better, or consent of instructor; and STAT 252 or any 300 level statistics course.

Theory and applications of financing business operations. Financial management of current and fixed assets from internal and external sources. Analysis, planning, control, and problem solving. The use of technology in the form of financial calculators and/or spreadsheets. 4 lectures.

BUS 346. Principles of Marketing. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: ECON 222 with a grade of C- or better for Business Administration and Economics majors; or ECON 201 with a grade of C- or better for Industrial Technology majors; or ECON 201 or ECON 222 with a grade of C- or better for all other majors; or consent of instructor.

Development of an understanding of the marketing process: identifying target markets; developing and launching products or services; and managing pricing, promotion, and distribution strategies. 2 lectures, 2 discussions.

BUS 382. Organizations, People, and Technology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better; and completion of GE Areas C1, C2, and D1-D4. Business majors must have formally declared their concentration to enroll.

Evaluation of macro dimensions of business organizations including environment, mission, goals, strategies, structure, people, technology, and internal management systems and processes. Case analysis, experiential class activities. Application to business solutions in technology-oriented settings. 4 lectures.

BUS 384. Human Resources Management. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better; and completion of GE Areas C1, C2, and D1-D4.

Introduction to functional areas of the discipline including staffing, compensation, employee development and labor relations. Additional workplace issues addressed include performance and human capital management, employer legal and social responsibility for employee wellbeing, managing a diverse/global workforce, and using human resource information systems. 4 lectures.

BUS 386. Employee Training and Development. 4 units

Term Typically Offered: W, SP

Prerequisite: BUS 384.

Needs assessment, including organization, person, and task or competency analysis. Design, delivery and evaluation of employee training and human resource development in knowledge-based organizational settings. Performance management and feedback systems; development of learning organizations; human resource information systems (HRIS) applications in career management and training administration. 4 lectures.

BUS 387. Organizational Behavior. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Completion of GE Area A with a grade of C- or better; ECON 221; and BUS 207. Recommended: STAT 252.

Application of behavioral, social and organizational science concepts to management. Exploration of the interactions between individuals and the organizations in which they work and live. Individual, interpersonal, team, intergroup and organizational levels of analysis included in topics such as expectations, perception, communications, creativity, leadership style, cultural and ethical behavior, group dynamics, team effectiveness and work design. 4 lectures.

BUS 389. Introduction to Business Negotiation for Entrepreneurs. 4 units

Term Typically Offered: SP

Prerequisite: Completion of GE Area A with a grade of C- or better. Entrepreneurship minors only.

Negotiation theory and skills required for successful entrepreneurship. Emphasis on negotiation simulations and role playing, with hands-on experience in applying negotiation skills. 4 lectures.

BUS 391. Information Systems. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: BUS 212 or BUS 214 for Industrial Technology and Packaging majors; BUS 214 for all other majors.

Computer applications in business and industry. Information systems and integrated systems concepts, computer hardware and software, strategic uses of information systems, databases, data warehousing, decision support systems and artificial intelligence, network basics, electronic commerce, systems development, ethical use of information, employing technology in a socially responsible manner, and emerging trends and technologies in information systems. 4 lectures.

BUS 392. Business Application Development. 4 units

Term Typically Offered: F, SP

Prerequisite: BUS 391.

The fundamental concepts and models of application development needed to understand the key processes related to building functioning business applications and appreciate the complexity of application development. The concepts of computer programming, data structures, problem solving, programming logic, and fundamental design techniques. Up-to-date application development tools and technologies currently used by business enterprises. 4 lectures.

BUS 393. Database Systems in Business. 4 units

Term Typically Offered: F, W

Corequisite: BUS 392; Business and Economics majors must have formally declared their concentration to enroll.

Design, development, testing, and implementation of databases for business applications. Data modeling with entity relationship diagrams (ERD) and class diagrams (UML). Data normalization, data integrity, the effect of business rules on data normalization. Advanced queries using structured query language (SQL). Database application development culminating in a database project. 4 lectures.

BUS 394. System Analysis and Design. 4 units

Term Typically Offered: W, SP

Prerequisite: BUS 391; Business and Economics majors must have formally declared their concentration to enroll.

Systems analysis and design. Project team creation and performance monitoring. Systems development life cycle and project management, process modeling using data flow diagrams, data modeling with Entity/Relationship (E/R) diagrams, Computer Assisted Software Engineering (CASE) tools, object modeling with Unified Modeling Language (UML), and prototype development. 4 lectures.

BUS 395. Systems Design and Implementation. 4 units

Term Typically Offered: SP

Prerequisite: BUS 394 (with a minimum grade of C- or better).

Systems design and implementation, with focus on project management and incorporating software quality into the software development process, including software testing. 4 lectures.

BUS 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Senior standing.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units.

BUS 401. General Management and Strategy. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 342, BUS 346, BUS 387, BUS 391, senior standing, and completion of one of the following: ITP 303, ITP 326, ITP 330, ITP 341, or ITP 371.

Application of interdisciplinary skills to business and corporate strategy analysis formulation and implementation of business, corporate and global level strategies. Consideration of interdependence between external environments and internal systems. Focus on responsibilities, tasks, and skills of general managers, including socially responsible behavior and governance. Case studies, group problem solving, experiential class activities. Capstone course of Business core curriculum. 4 seminars.

BUS 402. International Business Management. 4 units

Term Typically Offered: TBD

Prerequisite: BUS 342, BUS 346, and BUS 387.

Managerial concepts and techniques for analysis and decision making within international businesses. Environmental and organizational factors influencing multinational operations. Assessing international market opportunities and entry modes. Complexities of multinational management strategy, structure and systems, especially during initial stages of internationalization. Case studies and simulations. 4 lectures.

BUS 403. Advanced Seminar in International Management. 4 units

Term Typically Offered: TBD

Prerequisite: BUS 302 and BUS 402; Business majors must have formally declared their concentration to enroll.

Integration of management concepts within complex multinational organizations. Interdisciplinary approach to identifying and assessing multinational and global competitive environments and strategies; structuring and managing interdependent multinational operations; addressing conflicts between domestic and international policies and practices in multinational enterprises. Case studies, simulations, group analysis and problem solving. 4 seminars.

BUS 404. Governmental and Social Influences on Business. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 207 and ECON 222.

Analysis from legal, economic, political, and ethical perspectives, of the changing domestic and international environments of the business enterprise. Topics include administrative law, agencies and regulatory policy, antitrust law, public policy analysis, business-government relations, and corporate responsibility. Case studies. 4 lectures.

BUS 406. Managing Mergers, Acquisitions and Divestitures. 4 units

Term Typically Offered: TBD

Prerequisite: BUS 342, BUS 346, and BUS 387.

Issues associated with analyzing, negotiating, and managing mergers, acquisitions and divestitures (MADS) using cross-cultural, interdisciplinary perspective. Rationale for decision to pursue MADS and processes for identifying targets; valuing and negotiating MADS; staffing and human resource management issues; strategic control and integration; and cross-cultural conflict and divided loyalties in domestic and international MADS. Lectures, case studies and simulation. 4 lectures.

BUS 407. Managing People in Global Markets. 4 units

Term Typically Offered: TBD

Prerequisite: BUS 387.

Impact of cultural and strategic differences on management of people in multinational organizations. Critical human resource issues in domestic and international operations. 4 lectures.

BUS 409. Law of Real Property. 4 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Legal problems of acquisition, ownership and transfer of real property. Contracts, agency, estates, and co-ownership, mortgages and deeds, covenants, conditions, and restrictions, easements, landlord-tenant, and zoning. 4 lectures.

BUS 410. The Legal Environment of International Business. 4 units

Term Typically Offered: F, W

Prerequisite: BUS 207 and ECON 222.

U.S., foreign, and international law affecting international business transactions. U.S. and foreign cultural, ethical, and political norms and legal institutions, and their effect on law and business. 4 lectures.

BUS 412. Advanced Managerial Accounting. 4 units

Term Typically Offered: TBD

Prerequisite: BUS 215.

Product costing systems including hybrid costing systems, management control systems, cost allocation, activity based costing, cost information for decision making, new manufacturing environments, and strategic control systems. International dimension integrated in the course content. 4 lectures.

BUS 416. Volunteer Income Tax Assistance - Senior Project. 4 units

Term Typically Offered: W

Prerequisite: BUS 320 or equivalent, senior standing.

Training and practice in the preparation of state and federal individual income tax returns. Coverage of the deductions and credits applicable to individuals. Students provide free tax assistance and income tax preparation to community residents under the supervision of qualified professionals. 2 lectures, 2 activities.

BUS 417. Taxation of Corporations and Partnerships. 4 units

Term Typically Offered: F

Prerequisite: BUS 320 or equivalent.

Comparative study of the taxation of C corporations and flow-through tax entities, including S corporations, partnerships and limited liability companies. 4 lectures.

BUS 418. Listening to the Customer. 4 units

Term Typically Offered: F, W, SP

Prerequisite: For GRC Majors, GRC 361; for all other majors, BUS 346.

Discovery and development of customer insights based on a project-oriented introduction to the research process. Development of research questions, and design and application of multiple research methods (e.g. secondary, observation, interview, focus group, and survey research). Exploratory and confirmatory approaches leading to the analysis, interpretation, and presentation of results. 4 lectures.

BUS 419. Strategic Marketing Measurement. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 418, STAT 252; Business majors must have formally declared their concentration to enroll.

Development of skills to gather, analyze, and report information critical for marketing decision making. Focus on primary data collection and analytical techniques (e.g. experimental design, descriptive statistics, cross-tabulation, ANOVA, and regression). Other methods may include data mining, GIS, and customer relationship management (CRM). 4 lectures.

BUS 421. Marketing Analytics and Business Intelligence. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 418.

Analysis of customer information using a broad range of tools and techniques. Application of analytic findings to marketing decision-making. Integration of data into reporting platforms that emphasize return on marketing investment. 4 lectures.

BUS 422. Accounting for Government and Not-For-Profit Entities. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 321.

Accounting and reporting by state and local governments and not-for-profit entities. State and local governmental topics include: fund structures, budgetary accounting, the modified accrual basis of accounting, reporting concepts and practices, contributions, restricted resources, endowments. 4 lectures.

BUS 424. Accounting Ethics. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Study of professional values underlying the accounting profession. Methods for incorporation of ethical reasoning into accounting decision-making. Role of accounting ethics in development of financial statements. 4 lectures.

BUS 425. Auditing. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 322.

Survey of the auditing environment including institutional, ethical, and legal liability dimensions. Introduction to audit planning, assessing materiality and audit risk, collecting and evaluating audit evidence, considering the internal control structure, substantive testing, and reporting. 4 lectures.

BUS 430. Internship/Cooperative Education. 2-12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Approval of area chair, junior standing, and a CPSLO cumulative GPA of at least 2.5 without being on academic probation.

Work experience in business, industry, government and other areas of student career interest. Periodic written progress reports, final report, and evaluation by work supervisor required. Credit/No Credit grading. Major credit limited to 4 units; total credit limited to 12 units.

BUS 431. Security Analysis and Portfolio Management. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 342, ECON 339, or STAT 324; Business majors must have formally declared their concentration to enroll.

In-depth analysis of equity market and its instruments. Detailed study of leading stock valuation models. Impact of changes in the firm's fundamentals and in macroeconomic factors on stock prices. Brief introduction to equity and index derivatives. 4 lectures.

BUS 432. Insurance Planning and Risk Management. 4 units

Term Typically Offered: TBD

Prerequisite: BUS 342.

Introduction to insurance planning and risk management and its role in financial planning. Key concepts include determining risk exposure and selecting insurance products. Legal aspects of property and liability policy, life, health, and social insurance. 4 lectures.

BUS 433. International Finance. 4 units

Term Typically Offered: W, SP

Prerequisite: BUS 431 or BUS 439.

Financial management of international business. International capital and money markets, international financial institutions, special problems in evaluating direct foreign investment, and financial techniques used in international business operations. 4 lectures.

BUS 434. Real Estate Finance. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 439.

Analyses of real estate financing techniques and funding sources for development projects. Effects of federal, state, and local taxes on real estate investments. In-depth investigation and computer analyses of real estate investment projects. 4 lectures.

BUS 435. Real Estate Investment. 4 units

Term Typically Offered: W, SP

Prerequisite: BUS 439.

Intensive investigation and computer analysis of real estate investment opportunities. Problems in real estate and property management. 4 lectures.

BUS 436. Entrepreneurial Finance. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 342.

Process of financing new and fast-growing firms. Readings on the venture capital process, from seed capital through the initial public offering. Valuation of firms seeking venture capital, and those planning their initial public offering. Valuing convertible securities. Real options valuation. 4 seminars.

BUS 437. Retirement and Estate Planning. 4 units

Term Typically Offered: SP

Prerequisite: BUS 342.

Retirement planning and employee benefits; Social Security and Medicare; types of retirement plans; qualified plan characteristics; distribution options; and group insurance benefits. Trusts, power of attorney, and probate. 4 lectures.

BUS 438. Advanced Corporate Finance. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 431 and BUS 439.

Corporate finance with an emphasis on managing the corporation to create shareholder value. Detailed treatment of topics such as capital budgeting, capital structure, economic value-added, corporate distribution policy, financial distress, and mergers and acquisitions. 4 lectures.

BUS 439. Fixed Income Securities Market. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 342; Business majors must have formally declared their concentration to enroll.

Development of analytical skills for properly valuing fixed income securities. Bond pricing, yields, and volatility; interest rate term structure and yield curve; securities, market structure, and analytical techniques; bond portfolio strategies and an introduction to interest rate derivatives. 4 lectures.

BUS 441. Computer Applications in Finance. 4 units

Term Typically Offered: TBD

Prerequisite: BUS 342.

A combination lecture/computer lab course focusing on computer acquisition of financial data and the subsequent application of financial theory and analysis to this data so as to facilitate financial decision making. 3 lectures, 1 activity.

BUS 442. Introduction to Futures and Options. 4 units

Term Typically Offered: F, W

Prerequisite: BUS 431.

An in-depth analysis of derivatives markets and instruments. Emphasis on the valuation of futures, options, swaps, and other derivative securities. 4 seminars.

BUS 443. Case Studies in Real Estate Finance. 4 units

Term Typically Offered: SP

Prerequisite: BUS 431 or BUS 439.

Analytical and decision-making techniques in applying Financial Real Estate theory to business and property management valuation. Real estate valuation techniques and their application to real estate investment. Incorporates case studies, databases, and specialized real estate valuation software, such as ARGUS. 4 lectures.

BUS 444. Financial Engineering and Risk Management. 4 units

Term Typically Offered: SP

Prerequisite: BUS 431.

Advanced course synthesizing concepts from corporate finance, derivative securities, statistics, and computer science. Emphasis on both computer programming in a matrix programming language (Matlab) to solve practical risk management and valuation problems, and analytical training in the area of stochastic calculus, and its application to derivative security pricing. Practical applications of derivatives for controlling risk in an international corporate environment. 4 lectures.

BUS 445. Ethics and Behavior Finance. 4 units

Term Typically Offered: F, W

Prerequisite: BUS 342.

Contemporary theoretical and empirical issues including agency theory, reputation building, game theory, and financial ethics. Discussion of the application of ethics theory to financial decisions. May include lectures, case analyses, student presentations, and guest speakers. 4 lectures.

BUS 446. International Marketing. 4 units

Term Typically Offered: F, W

Prerequisite: BUS 346.

Development of an understanding of global marketing strategy. Acquisition of information about international markets and its use to describe customers, understand markets, and make marketing mix decisions. 4 lectures.

BUS 448. The Finance of Mergers and Acquisitions. 4 units

Term Typically Offered: SP

Prerequisite: BUS 438.

Comprehensive coverage of financial aspects concerning mergers and acquisitions. Valuation of companies, strategic and other motivations underlying mergers, structuring of transactions, deal tactics and strategy, leveraged buyouts, and cross-border mergers. Most suitable for careers in corporate finance, and investment banking. 4 lectures.

BUS 451. New Product Development and Launch. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 418, STAT 252; Business and Economics majors must have formally declared their concentration to enroll.

Project-based skills for developing new products and planning for their launch. Major phases of product development: product innovation strategy, idea generation and screening, concept development and testing, technology drivers. Introduction to product launch, including segmentation, targeting, positioning, pricing, and branding. 4 lectures.

BUS 452. Product Management. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 419.

Development of individual and project-based skills in managing products in the growth, maturity, and decline stages of their life cycles. Emphasis on distribution, pricing, and communication strategies required to maintain distinctive product advantages. May include developing a comprehensive communication plan and acquiring market-tracking skills. 4 lectures.

BUS 453. Digital and New Media Marketing. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 418; GRC 201 or GRC 377; JOUR 331; and JOUR 342.

Definitions, scope, phases, and tools of digital and new media marketing communications. Planning integrated marketing communications in a systematic way across digital tools and new media channels that reflect a client organization's strategy for managing its identity, image, and reputation. 4 lectures.

BUS 454. Marketing Projects. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 451 and BUS 452.

Client-based course providing an opportunity to apply marketing abilities. Teams draw upon research, analytical, and strategic marketing skills to develop an actionable plan that addresses a critical marketing challenge faced by an organization. Deliverables include research findings and written and verbal presentation to the organization and instructor. 4 lectures.

BUS 455. Marketing Strategy. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 451 and BUS 452.

Integration of key marketing concepts using tools such as computer simulations, readings, and/or case studies. Development and implementation of strategic and tactical decisions for companies and brands. 4 lectures.

BUS 458. Solving Big World Challenges. 4 units

Term Typically Offered: F, W

Prerequisite: Completion of GE Area A with a grade of C- or better.

Apply human-centered design practices to address a social or an environmental challenge, specific to a local community. Achieve revenue-generating social impact through innovative business models. Practice team competencies including problem-solving, interviewing, brainstorming, prototyping, and written, visual, and oral communication. 4 lectures. Crosslisted as BUS/COMS 458.

BUS 459. Social Media's Role in Integrated Marketing Communications. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 453.

Integrative project experience in social media marketing and/or integrative marketing communications campaign: research target markets, identify appropriate social media and other media channels. Field trips required. 4 seminars.

BUS 461. Senior Project I. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Senior standing.

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

BUS 462. Senior Project II. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Senior standing.

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

BUS 463. Senior Project: Low Income Taxpayer Clinic. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing; BUS 320; Graduation Writing Requirement; and approval of the Instructor.

Acquire fundamental knowledge of federal tax laws and procedures in a clinical setting. Practice with multiple authoritative accounting, auditing and tax databases, conduct legal research, and business writing. Resolve real world accounting, auditing and tax controversies for Low Income Taxpayer Clinic clients.

BUS 464. Applied Senior Project Seminar. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Senior standing.

Selection and analysis of business problems and opportunities in directed individual or group-based projects. Problems typical to those which graduates could encounter in their fields of employment. Formal report required. 4 seminars.

BUS 466. Senior Project: Sales Development Program. 4 units

Term Typically Offered: F, W

Prerequisite: AGB 309 or BUS 346; and Senior standing.

Develop selling skills, create a sales portfolio, participate in sales role plays and sales competition, observe a salesperson in action, and explore selling as a career. Formal report required. 4 seminars.

BUS 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 lectures.

BUS 471. Compensation. 4 units

Term Typically Offered: SP

Prerequisite: BUS 384 and STAT 252, or equivalent.

Design and management of compensation systems. Job analysis, job evaluation, wage and salary surveys, incentive systems, gainsharing, benefit administration, pay equity and legal regulation. Simulation and case study development of a wage structure, pay level and individual raise policies, administrative controls, salary and program budgets. 4 lectures.

BUS 473. Employment Law. 4 units

Term Typically Offered: TBD

Prerequisite: BUS 207, BUS 384 or equivalent.

Federal and state labor policy as expressed in common law, relevant statutes, and executive orders. Effects upon employees, management, protected groups, and the public. Current rules analyzed in a contemporary and historical context. Understanding important workplace and employment problems. 4 lectures.

BUS 474. Independent Study in Accounting. 4 units

Term Typically Offered: TBD

Prerequisite: BUS 322.

Individual investigation, research, study or survey of selected topics in accounting, auditing or taxation. Total credit limited to 8 units, repeatable in the same term. Class Schedule will list topic selected.

BUS 475. Staffing. 4 units

Term Typically Offered: F, SP

Prerequisite: BUS 384 and STAT 252, or equivalent.

Processes by which individuals and organizations become matched to form the employment relationship. Specific issues related to human resources planning, internal and external recruitment and selection. 4 lectures.

BUS 477. Managing Change and Development. 4 units

Term Typically Offered: W, SP

Prerequisite: BUS 382 or BUS 387.

Analysis of development and trends in the field of organization change and development. Application of behavioral and organizational science knowledge and social technology to growth and change of organizations for the purpose of improving effectiveness and sustainability. 4 seminars.

BUS 488. Planning and Managing New Ventures. 4 units

Term Typically Offered: F

Prerequisite: BUS 215, BUS 310, BUS 342, BUS 346 and BUS 436; Business majors must have formally declared their concentration to enroll.

The purpose and process of business planning and the challenges of managing a start-up enterprise. Preparation of a complete business plan: management and organization; product or service; marketing; finance; operating and control systems; growth. 4 seminars.

BUS 489. Negotiation. 4 units

Term Typically Offered: F, W

Prerequisite: BUS 387.

Theory and practice of negotiation in a variety of professional and managerial contexts (e.g., labor relations, business acquisitions, compensation, business disputes) and in one-on-one, group, and team-based arrangements. Includes impact of culture, ethics, dispute resolution, coalitions and use of creativity to develop integrative solutions. 4 lectures.

BUS 491. Decision Support Systems. 4 units

Term Typically Offered: SP

Prerequisite: BUS 391, STAT 251 or equivalent; Business and Economics majors must have formally declared their concentration to enroll.

Modeling organizational systems and processes such as computer networks, transportation systems, manufacturing systems, retail systems, etc. Developing computer simulation models and animation of systems to provide decision support in selecting system design alternatives. Applying quantitative methods to model uncertainty and conduct statistical performance analysis. 4 lectures.

BUS 495. Software Testing. 4 units

CR/NC

Term Typically Offered: W

Prerequisite: BUS 392.

Theory and practice of software testing, including state-of-the-art practices, design issues, staffing issues, test management issues, and other related areas. Software testing tools utilized for applications testing, and test management. 4 lectures.

BUS 496. Electronic Commerce. 4 units

Term Typically Offered: TBD

Prerequisite: BUS 392.

Focus on the technology of electronic commerce, including programming, development environments and security, through a series of lectures, guest speakers, demonstrations, exercises and case studies. Networking, client/server computing, and web/database design concepts. Working e-commerce application required at end of course. 4 lectures.

BUS 498. Directed Topics in Information Systems. 4 units

Term Typically Offered: F, W

Prerequisite: BUS 392.

Specialized Information Systems (IS) topic selected from the IS areas of current interest. Intended for advanced IS concentration students who want to learn and acquire in-depth IS knowledge and skills. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures.

BUS 499. Data Communications and Networking. 4 units

Term Typically Offered: SP

Prerequisite: BUS 391; Business and Economics majors must declare their concentrations in order to enroll.

Combines the fundamental concepts of data communications and networking with practical applications in business. Provides a basic understanding of the technical and managerial aspects of business telecommunication. Introduction to data communications and applications and technical fundamentals, and to network products, technologies, applications, and services. 4 lectures.

Chemistry (CHEM)

CHEM Courses

CHEM 101. Introduction to the Chemical Sciences. 1 unit

CR/NC

Term Typically Offered: F

Prerequisite: BCHEM/CHEM majors only.

Introduction to the chemistry and biochemistry disciplines. Orientation, advising, career opportunities and introduction to the faculty. Designed for first-year CHEM and BCHEM majors. Credit/No Credit grading only. 1 lecture.

CHEM 106. Introductory Chemistry. 3 units

Term Typically Offered: TBD

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level.

Introductory course in chemistry. Measurement, metric system, properties of matter, chemical symbols, atomic structure, chemical formulas, nomenclature, chemical equations, the mole concept, stoichiometry. Not open to students majoring in Chemistry or Biochemistry. Not open to students with credit in CHEM 110, CHEM 111, CHEM 124, or CHEM 127. 3 lectures.

CHEM 110. World of Chemistry. 4 units

GE Area B3; GE Area B4

Term Typically Offered: F, W, SP

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level.

The fundamentals of chemical cause and effect-structure/function relationships. The basic principles of chemistry and their applications to solving human problems in organic materials science, biochemistry, toxicology, environmental science, agriculture, nutrition, and medicine. Not open to students majoring in Chemistry or Biochemistry. Not open to students with credit in CHEM 111, CHEM 124, or CHEM 127. 3 lectures, 1 laboratory. Fulfills Ge Area B3 & B4.

CHEM 111. Survey of Chemistry. 5 units

GE Area B3; GE Area B4

Term Typically Offered: F, W, SP

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level. Recommended: High school chemistry or CHEM 106 or equivalent.

Introduction to atomic theory, chemical reactions, bonding, stoichiometry, nomenclature, and solutions. Intended for students who are preparing for CHEM 212/312. Not open to students with credit in CHEM 124 or CHEM 127. Credit will be granted in only one of the following courses: CHEM 110 or CHEM 111. 4 lectures, 1 laboratory. Fulfills GE Area B3 & B4.

CHEM 124. General Chemistry for Physical Science and Engineering I. 4 units

GE Area B3; GE Area B4

Term Typically Offered: F,W,SP,SU

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level. Recommended: High school chemistry or equivalent.

Stoichiometry, thermochemistry, atomic structure, bonding, solid-state structures, intermolecular forces, and foundational principles of organic chemistry. Not open to students with credit in CHEM 127. Credit will be granted in only one of the following courses: CHEM 110, CHEM 111, or CHEM 124. 3 lectures, 1 laboratory. Fulfills GE Area B3 & B4.

CHEM 125. General Chemistry for Physical Science and Engineering II. 4 units

GE Area B3; GE Area B4

Term Typically Offered: F, W, SP

Prerequisite: CHEM 124, or AP Chemistry score of 5.

Topics include solution chemistry, thermodynamics, kinetics, equilibrium (including acids and bases), electrochemistry, and nuclear chemistry. Not open to students with credit in CHEM 128. 3 lectures, 1 laboratory. Fulfills GE B3 & B4.

CHEM 126. General Chemistry for Physical Science and Engineering III. 4 units

Term Typically Offered: SP

Prerequisite: CHEM 125 with a grade of C- or better or consent of instructor.

Topics in equilibrium, kinetics, acid-base chemistry, and molecular structure, contextualized within major sub-disciplines of chemistry. Not open to students with credit in CHEM 129. 3 lectures, 1 laboratory.

CHEM 127. General Chemistry for Agriculture and Life Science I. 4 units

GE Area B3; GE Area B4

Term Typically Offered: F, W

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level. Recommended: High school chemistry or equivalent.

Introduction to atomic theory, chemical reactions, bonding, stoichiometry, nomenclature, gas laws, thermochemistry, molecular structure, and intermolecular forces. Intended primarily for students in agriculture and life sciences. Not open to students with credit in CHEM 124. Credit will be granted in only one of the following courses: CHEM 110, CHEM 111, or CHEM 127. 3 lectures, 1 laboratory. Fulfills GE Area B3 & B4.

CHEM 128. General Chemistry for Agriculture and Life Science II. 4 units

Term Typically Offered: W, SP

Prerequisite: CHEM 127 or AP Chemistry score of 5.

Continuation of CHEM 127. Colligative properties, colloids and solutions, oxidation-reduction reactions, electrochemistry, kinetics, equilibria, and thermodynamics. Not open to students with credit in CHEM 125. 3 lectures, 1 laboratory.

CHEM 129. General Chemistry for Agriculture and Life Science III. 4 units

Term Typically Offered: F, SP

Prerequisite: CHEM 128.

Continuation of CHEM 128. Acid and base equilibria, buffers, transition elements, solubility, complex ions, hybrid orbital theory, molecular orbital theory, and nuclear chemistry. Laboratory study of the chemical properties and semi-micro qualitative analysis of the representative group elements of the periodic table. Not open to students with credit in CHEM 126. 3 lectures, 1 laboratory.

CHEM 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CHEM 111, CHEM 124, or CHEM 127 and consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

CHEM 201. Undergraduate Research. 1-3 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Laboratory research under faculty supervision. Credit/No Credit grading only. Total credit limited to 6 units. 1-3 laboratories.

CHEM 202. Orientation to Biotechnology. 2 units

Term Typically Offered: F, W

Prerequisite: Completion of a course with a BIO, BOT or MCRO prefix and a course with a CHEM prefix.

Introduction to the diversity of fields in biotechnology. Applications in agriculture, nutrition, medicine and environmental problems. 1 lecture, 1 activity. Crosslisted as BIO/CHEM 202.

CHEM 203. Undergraduate Seminar I. 1 unit

CR/NC

Term Typically Offered: W, SP

Prerequisite: CHEM 126.

Introduction to basic scientific literature and scientific presentation skills. Targeted advising and preparation for research and career opportunities. Designed for second-year students majoring in Biochemistry or in Chemistry. Credit/No Credit grading only. 1 seminar.

CHEM 212. Introduction to Organic Chemistry. 5 units

Term Typically Offered: TBD

Prerequisite: CHEM 111, CHEM 124 or CHEM 127.

Structure, isomerism, nomenclature, fundamental reactions of major functional groups and applications of organic chemicals in agriculture, medicine, industry, and the home. CHEM 212 accepted in lieu of CHEM 312, but not for upper division credit. Not open to students with credit in CHEM 312, CHEM 216/316. 4 lectures, 1 laboratory.

CHEM 216. Organic Chemistry I. 5 units

Term Typically Offered: F, W

Prerequisite: CHEM 126 or CHEM 129 with a grade of C- or better or consent of instructor.

Fundamental concepts and laboratory skills of organic chemistry. Structure, bonding, nomenclature, isomerism, stereochemistry and physical properties of organic compounds. Introduction to spectroscopy. Reactions and mechanisms of alkanes, alkenes and alkyl halides. Fundamental laboratory techniques in organic chemistry. Not open to students with credit in CHEM 316. 4 lectures, 1 laboratory.

CHEM 217. Organic Chemistry II. 3 units

Term Typically Offered: W, SP

Prerequisite: CHEM 216 with a grade of C- or better or consent of instructor. Corequisite: CHEM 221 for Chemistry and Biochemistry majors; or CHEM 220 for non-Chemistry and non-Biochemistry majors.

Properties and reactions of carbonyl compounds, alcohols, ethers, amines and carbohydrates with an in-depth treatment of the reaction mechanisms. Introductory concepts and applications of infrared and NMR spectroscopy. Not open to students with credit in CHEM 317. 3 lectures.

CHEM 218. Organic Chemistry III. 3 units

Term Typically Offered: F, SP

Prerequisite: CHEM 217 with a grade of C- or better or consent of instructor. Corequisite: CHEM 324 for Chemistry and Biochemistry majors; or CHEM 223 for non-Chemistry and non-Biochemistry majors.

Properties and reactions of alkynes, heterocyclic and aromatic compounds with an in-depth treatment of the mechanisms of the reactions. Introductory concepts and applications of ultraviolet spectroscopy and mass spectrometry. Not open to students with credit in CHEM 318. 3 lectures.

CHEM 220. Organic Chemistry Laboratory For Life Sciences II. 1 unit

Term Typically Offered: W, SP

Corequisite: CHEM 217.

Laboratory experiments exploring reactions in organic chemistry, applying fundamental laboratory techniques covered in CHEM 216. Not open to Chemistry and Biochemistry majors. 1 laboratory.

CHEM 221. Organic Chemistry Laboratory II. 2 units

Term Typically Offered: W, SP

Prerequisite: major in Chemistry or Biochemistry. Corequisite: CHEM 217.

Laboratory experiments exploring reactions in organic chemistry, applying fundamental laboratory techniques covered in CHEM 216. 2 laboratories.

CHEM 222. Introduction to Computational Chemistry. 2 units

Term Typically Offered: TBD

Prerequisite: CHEM 126 or CHEM 129; CHEM 216 or CHEM 316; MATH 142 or MATH 162.

Introduction to chemical structure and behavior by computational chemistry techniques. Applications include scientific visualization, molecular modeling, geometry optimization, transition states and molecular dynamics. 1 lecture, 1 laboratory.

CHEM 223. Organic Chemistry Laboratory for Life Sciences III. 1 unit

Term Typically Offered: F, SP

Corequisite: CHEM 218.

Practice in multi-step organic synthesis, enzymatic organic chemistry, biomimetic organic chemistry. Not open to Biochemistry or Chemistry majors. 1 laboratory.

CHEM 231. Quantitative Analysis. 5 units

Term Typically Offered: TBD

Prerequisite: CHEM 126 or 129.

Theory and application of chemical equilibrium to analytical problems. Survey of important analytical methods with stress placed on the theory and application associated with titrimetric and spectrophotometric analysis. 3 lectures, 2 laboratories.

CHEM 252. Laboratory Glassblowing. 1 unit

Term Typically Offered: TBD

Prerequisite: CHEM 111, CHEM 124 or CHEM 127.

Techniques of glassblowing applied to the making of simple laboratory apparatus. 1 laboratory.

CHEM 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

CHEM 302. Marine Chemistry. 3 units

Term Typically Offered: SP

Prerequisite: CHEM 216 or CHEM 312.

Introduction to chemical processes in the ocean including chemical oceanography and marine chemical ecology. 3 lectures.

CHEM 303. Undergraduate Seminar II. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: CHEM 203 and CHEM 218.

Advanced exploration of more sophisticated scientific literature and scientific presentation skills. Targeted advising and preparation for research and career opportunities. Designed for third-year CHEM and BCHM majors. Credit/No Credit grading only. 1 seminar.

CHEM 308. Genetic Engineering Technology. 4 units

GE Area F

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area B2, and one of the following: CHEM 110, 111, 124 or 127.

Introduction to the methodology and techniques used in genetic engineering. Applications in agriculture, nutrition, medicine and environmental problems. Potential benefits and problems, including the underlying ethical questions. Not open to students with credit in CHEM 373, or to Biological Sciences, Marine Sciences, or Microbiology majors. 4 lectures. Crosslisted as BIO/CHEM 308. Fulfills GE Area F.

CHEM 312. Survey of Organic Chemistry. 5 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CHEM 125 or CHEM 128.

Structure, isomerism, nomenclature, fundamental reactions of major functional groups and applications of organic chemicals in agriculture, medicine, industry, and the home. Not open to students with credit in CHEM 212 or CHEM 216/316. 4 lectures, 1 laboratory.

CHEM 313. Survey of Biochemistry and Biotechnology. 5 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CHEM 212, CHEM 216, CHEM 312, or CHEM 316.

Chemistry of biomolecules including carbohydrates, proteins, fats, vitamins, enzymes and hormones. Basic molecular biology with applications to biotechnology and genetic engineering. Practical intermediary metabolism of prokaryotic and eukaryotic systems. 4 lectures, 1 laboratory.

CHEM 324. Organic Chemistry Laboratory III. 2 units

Term Typically Offered: F, SP

Prerequisite: major in Chemistry or Biochemistry. Corequisite: CHEM 218.

Practice in multiple step organic synthesis, column chromatography, vacuum distillation, enzymes as chemical reagents, inert atmosphere techniques, introduction to FT NMR spectroscopy and mass spectrometry, survey of organic chemical literature. 2 laboratories.

CHEM 331. Quantitative Analysis. 5 units

Term Typically Offered: F, SP, SU

Prerequisite: CHEM 126 or 129.

Theory and application of chemical equilibrium to analytical problems. Survey of important analytical methods with stress placed on the theory and application associated with titrimetric and spectrophotometric analysis. 3 lectures, 2 laboratories.

CHEM 341. Environmental Chemistry: Water Pollution. 3 units

Term Typically Offered: TBD

Prerequisite: CHEM 126 or 129; and CHEM 212 or CHEM 312; or CHEM 216 or CHEM 316.

Chemical aspects of water and water pollution: alkalinity; acid deposition, particularly relating to lake and stream acidification and forest decline; drinking water treatment and trihalomethanes; wastewater treatment; detergents, builders, and eutrophication; pesticides; other toxic organic compounds such as PCBs and dioxin; hazardous wastes; toxic elements such as Pb, Hg, Sn, Cd, and Se. 3 lectures.

CHEM 349. Chemical and Biological Warfare. 4 units

GE Area F

Term Typically Offered: F, SP

Prerequisite: Junior standing, completion of GE Area B, including a chemistry course (CHEM), and a course in biology (BIO, MCRO or ZOO).

History, development, and use of chemical and biological warfare (CBW). Chemical and biological disarmament. Production and destruction of CBW agents. Uses of CBW. CBW terrorism. Ethics of CBW. 2 lectures, 2 seminars. Fulfills GE Area F.

CHEM 350. Chemical Safety. 1 unit

Term Typically Offered: TBD

Prerequisite: CHEM 212/312 or CHEM 216/316.

Laboratory regulations, equipment hazard analysis, hazardous chemicals, classification of chemicals, toxic materials handling, reaction hazards, radiation, emergency procedures, safety management programs and legal concerns. Includes project. 1 lecture.

CHEM 351. Physical Chemistry I. 3 units

Term Typically Offered: F, W

Prerequisite: CHEM 126 or CHEM 129; MATH 143; PHYS 122 or PHYS 132.

Basic physical chemistry for the study of chemical and biochemical systems. Kinetic-molecular theory, gas laws, principles of thermodynamics. 3 lectures.

CHEM 352. Physical Chemistry II. 3 units

Term Typically Offered: W, SP

Prerequisite: CHEM 351.

Application of physical chemistry to chemical and biochemical systems. Electrochemistry, kinetics, viscosity, surface and transport properties. 3 lectures.

CHEM 353. Physical Chemistry III. 3 units

Term Typically Offered: F, SP

Prerequisite: CHEM 352.

Principles and applications of quantum chemistry. Chemical bonding and molecular structure. Spectroscopy and diffraction. 3 lectures.

CHEM 354. Physical Chemistry Laboratory. 2 units

Term Typically Offered: W, SP

Prerequisite: CHEM 231/331. Corequisite: CHEM 352.

Experimental studies of gases, solutions, thermochemistry, chemical and phase equilibria, electrochemistry, chemical and enzyme kinetics, computational methods and applications to chemistry and biochemistry. Applicable literature and databases. 2 laboratories.

CHEM 357. Physical Chemistry III Lab. 1 unit

Term Typically Offered: F, SP

Corequisite: CHEM 353.

Experimental and computational investigations of quantum chemistry, spectroscopy, symmetry and statistical chemistry. 1 laboratory.

CHEM 371. Biochemical Principles. 5 units

Term Typically Offered: F, W, SP

Prerequisite: CHEM 217 or CHEM 317; and BIO 161. Recommended: CHEM 231/331.

Chemistry and function of major cellular constituents: proteins, lipids, carbohydrates, and membranes. 4 lectures, 1 laboratory.

CHEM 372. Metabolism. 4 units

Term Typically Offered: F, SP

Prerequisite: CHEM 371.

Intermediary metabolism of carbohydrates, lipids, amino acids and nucleotides, regulation and integration of metabolic pathways, bioenergetics, photosynthesis, electron transport, nitrogen fixation, biochemical function of vitamins and minerals. 4 lectures.

CHEM 373. Molecular Biology. 3 units

Term Typically Offered: W, SP

Prerequisite: CHEM 371.

Structure of nucleic acids and chromosomes. Mechanisms and regulation of nucleic acid and protein synthesis. Molecular biology techniques. 3 lectures.

CHEM 377. Chemistry of Drugs and Poisons. 3 units

Term Typically Offered: W

Prerequisite: CHEM 313 or CHEM 371.

Introduction to pharmacology and toxicology: history, sources, development and testing, physical and chemical properties, biochemical and physiological effects, mechanisms of action, and the therapeutic uses and toxicology of common drugs and poisons. 3 lectures.

CHEM 400. Special Problems for Advanced Undergraduates. 1-3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing and consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 3 units per quarter. 1-3 laboratories.

CHEM 401. Advanced Undergraduate Research. 1-3 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Laboratory research under faculty supervision. Credit/No Credit grading only. Total credit limited to 6 units. 4 units may be applied to approved chemistry electives. 1-3 laboratories.

CHEM 403. Undergraduate Seminar III: Senior Project. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: CHEM 303 and CHEM 352.

Culminating experience with high level scientific literature and scientific presentation skills. Targeted advising and preparation for research and career opportunities. Designed for fourth-year CHEM and BCHM majors. 1 seminar.

CHEM 405. Advanced Physical Chemistry. 3 units

Term Typically Offered: W

Prerequisite: CHEM 353.

Selected advanced topics in physical chemistry, which may include statistical mechanics, computational chemistry, nonequilibrium thermodynamics, lasers in chemistry, solid-state and/or advanced spectroscopy. Total credit limited to 6 units. 3 lectures.

CHEM 414. Advanced Organic Chemistry - Mechanisms. 3 units

Term Typically Offered: W

Prerequisite: CHEM 218 or CHEM 318.

A mechanistic study of organic reactions; correlation of structure with reactivity; reaction intermediates and species involved in reactions; methods of probing reaction mechanisms. 3 lectures.

CHEM 418. Neurochemistry. 3 units

Term Typically Offered: F

Prerequisite: BIO 161 and CHEM 217.

Introduction to the chemistry of neurotransmission. Emphasis on molecular makeup and function of voltage gated ion channels; receptors and enzymes involved in signal transduction; biosynthesis, storage, release, reuptake, and breakdown of major neurotransmitters. Mechanism of action of agonists and antagonists, and their effects on the central and peripheral nervous systems. 3 lectures.

CHEM 419. Bioorganic Chemistry. 3 units

Term Typically Offered: TBD

Prerequisite: CHEM 218 or CHEM 318; CHEM 313 or CHEM 371.

Methods of investigating reaction mechanisms, mechanisms of chemical catalysis, organic models of enzymes, chemistry of vitamins that serve as enzyme cofactors, chemistry of the phosphate group, synthesis of biomolecules. 3 lectures.

CHEM 420. Advanced Organic Chemistry - Synthesis. 3 units

Term Typically Offered: SP

Prerequisite: CHEM 218/318.

Modern methods of organic synthesis. Carbon-carbon bond forming reactions, functional group transformations, protecting groups, strategies of total synthesis of natural products. 3 seminars.

CHEM 439. Instrumental Analysis. 5 units

Term Typically Offered: W

Prerequisite: CHEM 231/331, CHEM 354. Recommended: CHEM 353.

Theory, practice and method selection of modern instrumental analytical techniques, including spectroscopic, electrochemical, chromatographic and thermal methods. Current industrial applications. Laboratory work emphasizes optimization of experimental parameters. 3 lectures, 2 laboratories.

CHEM 441. Bioinformatics Applications. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing; BIO 161 or BIO 303. Recommended: BIO 302 or BIO 303 or BIO 351 or CHEM 373.

Introduction to new problems in molecular biology and current computer applications for genetic database analyses. Use of software for: nucleic acid, genome and protein sequence analysis; genetic databases, database tools; industrial applications in bioinformatics; ethical and societal concerns. 3 lectures, 1 laboratory. Crosslisted as BIO/CHEM 441.

CHEM 444. Polymers & Coatings I. 3 units

Term Typically Offered: F

Prerequisite: CHEM 212/312 or CHEM 216/316.

Physical properties of polymers and coatings and their measurement. Molecular weight averages, glass transition, thermodynamics of polymers. Viscoelastic properties, rheology, molecular weight determination. Thermal analysis, spectroscopic analysis, mechanical testing. 3 lectures.

CHEM 445. Polymers & Coatings II. 3 units

Term Typically Offered: W

Prerequisite: CHEM 217/317 and CHEM 444.

Introduction to polymerization methods and mechanisms. Chemistry of initiators, catalysts and inhibitors, kinetics of polymerization. Uses of representative polymer types. Synthesis, film formation, structure and properties of polymers commonly used in coatings and adhesives. 3 lectures.

CHEM 446. Surface Chemistry of Materials. 3 units

Term Typically Offered: SP

Prerequisite: CHEM 125 or CHEM 128; CHEM 351, MATE 380, or ME 302.

Surface energy. Capillarity, solid and liquid interface, adsorption. Surface areas of solids. Contact angles and wetting. Friction, lubrication and adhesion. Relationship of surface to bulk properties of materials. Applications. 3 lectures. Crosslisted as CHEM/MATE 446.

CHEM 447. Polymers and Coatings Laboratory I. 2 units

Term Typically Offered: F

Corequisite: CHEM 444.

Experimental techniques of producing and characterizing coatings. Polymer characterization and analysis. Molecular weight analysis using viscometry, light scattering, and gel permeation chromatography. Thermal analysis using differential scanning calorimetry, thermal mechanical analysis and dynamic mechanical analysis. Polymer rheology. Infrared, Raman and FT-NMR spectroscopy. Atomic force microscopy. 2 laboratories.

CHEM 448. Polymers and Coatings Laboratory II. 2 units

Term Typically Offered: W

Prerequisite: CHEM 447. Corequisite: CHEM 445.

Polymer synthesis using solution, suspension, bulk, emulsion techniques. Synthesis of chain growth polymers using free radical, anionic, cationic, and other catalysts. Synthesis of step-growth polymers. Kinetics of polymer reactions. Synthesis of resins used in modern coatings. 2 laboratories.

CHEM 449. Polymers and Coatings Internship. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CHEM 444.

Selected students will spend up to 12 weeks with an approved polymers and coatings firm engaged in production or related business. Time will be spent applying and developing production and technical skills and abilities in the polymers and coatings industry.

CHEM 450. Polymers and Coatings III. 3 units

Term Typically Offered: SP

Prerequisite: CHEM 444 or CHEM 544.

Formulation of modern coatings. Raw materials including resins, solvents, pigments, and additives. Formulation principles for solvent-borne and coatings, waterborne, powder, radiation cure and architectural coatings. Regulatory issues; VOC's. Coating properties, film formation, film defects, application methods, color and color acceptance. Not open to students with credit in CHEM 550. 3 lectures.

CHEM 451. Polymers and Coatings Laboratory III. 2 units

Term Typically Offered: SP

Prerequisite: CHEM 447 or CHEM 547. Corequisite: CHEM 450.

Recommended: CHEM 445 or CHEM 545; CHEM 448 or CHEM 548; CHEM 446.

Preparation and characterization of coatings - solvent based and waterborne. Thermoplastic and thermosetting coatings. Coating film preparation methods. Applications of spectroscopy, scanning probe microscopy, thermal analysis, rheology in characterizing coatings. VOC, long-term exposure testing. Measurement of appearance (color, gloss). Not open to students with credit in CHEM 551. 2 laboratories.

CHEM 454. Functional Polymeric Materials. 4 units

Term Typically Offered: SP

Prerequisite: CHEM 212 or CHEM 216 or CHEM 312 or CHEM 316; CHEM 351 or MATE 380; or graduate standing.

Structure-property-processing correlations of functional polymeric materials. Additive group contribution methodologies for predicting and determining physical properties. Semi-empirical approaches for estimating and evaluating the values of physical properties from chemical structures. 4 lectures.

CHEM 458. Instrumental Organic Qualitative Analysis. 3 units

Term Typically Offered: F

Prerequisite: CHEM 324.

Separation, purification, and identification of organic molecules using chemical and instrumental methods, including nuclear magnetic resonance, infrared and ultraviolet spectroscopy and mass spectroscopy, and techniques in high resolution FT-NMR. 1 lecture, 2 laboratories.

CHEM 459. Undergraduate Seminar. 2 units

Term Typically Offered: F,W,SP,SU

Corequisite: CHEM 218 or CHEM 318 and junior standing.

Oral presentation of current developments in chemistry based on current literature. Searching for, organizing and presenting developments from current literature in chemistry and biochemistry. Preparation for employment and for independent work, including senior project, in chemistry and biochemistry. 2 seminars.

CHEM 461. Senior Project Report. 1 unit

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Completion of a senior project report under faculty supervision. Minimum 30 hours time commitment.

CHEM 463. Honors Research. 1 unit

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing and consent of instructor.

Advanced laboratory research. Results are presented in a poster session or other public forum. Total credit limited to 2 units with a maximum of 1 unit per quarter. 1 laboratory.

CHEM 465. College Teaching Practicum. 1-2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Junior standing, CHEM 231/331 (or permission of instructor), evidence of satisfactory preparation in chemistry; department chair approval required.

Teaching assignment in an undergraduate college classroom. Includes teaching and related activities under the direction of a permanent faculty member in the Department of Chemistry and Biochemistry. Total credit limited to 4 units.

CHEM 466. Learning Assistant Seminar. 2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of instructor.

Pedagogical instruction and introduction to education research for Chemistry Learning Assistants. Effective questioning, the effect of explanatory knowledge on student learning, student misconceptions in chemistry, collaborative problem solving techniques in chemistry, studio curriculum development, content in the general chemistry curriculum. Total credit limited to 4 units. Credit/No Credit grading only. 2 seminars.

CHEM 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: CHEM 351, CHEM 217 or CHEM 317.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

CHEM 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

CHEM 474. Protein Techniques Laboratory. 3 units

Term Typically Offered: F, W, SP

Prerequisite: CHEM 371.

Experiments in protein purification and analysis from recombinant sources. Ion-exchange and affinity chromatography, electrophoresis and blotting. UV, chemical, immune, and fluorescent detection. Enzyme kinetic analysis. 1 lecture, 2 laboratories.

CHEM 475. Molecular Biology Laboratory. 3 units

Term Typically Offered: SP

Prerequisite: BIO 161, and grade of C- or better in BIO 351 or CHEM 373 or consent of instructor.

Introduction to techniques used in molecular biology and biotechnology; DNA extraction, characterization, cloning, Southern blotting, reverse transcription, polymerase chain reaction, and sequencing analysis. 1 lecture, 2 laboratories. Crosslisted as BIO/CHEM 475.

CHEM 476. Gene Expression Laboratory. 3 units

Term Typically Offered: TBD

Prerequisite: BIO/CHEM 475; CHEM 313 or CHEM 371, or graduate standing in Biological Sciences.

Heterologous gene expression of a recombinant protein in a microbial system: gene cloning, construction of expression plasmid, DNA sequence analysis, transformation of microbial host, selection and analysis of transformed host cells, expression and purification of recombinant protein. 1 lecture, 2 laboratories. Crosslisted as BIO/CHEM 476.

CHEM 477. Biochemical Pharmacology. 3 units

Term Typically Offered: TBD

Prerequisite: CHEM 218 or CHEM 318.

Consideration of current selected topics in pharmacology and drug targeting. 3 lectures.

CHEM 481. Inorganic Chemistry. 3 units

Term Typically Offered: F

Prerequisite: CHEM 352 and CHEM 231/331.

A systematic study of chemical and physical properties of inorganic compounds based on periodic groupings with emphasis on chemical bonding and structure. Topics will include coordination chemistry and kinetics, organometallic chemistry, advanced acid-base relationships and bonding theories plus other selected topics. 3 lectures.

CHEM 484. Inorganic Chemistry Laboratory. 2 units

Term Typically Offered: F

Corequisite: CHEM 481.

Laboratory techniques in inorganic chemistry. Synthetic and analytic techniques as applied to inorganic and organometallic chemistry. 2 laboratories.

CHEM 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. 2 units only applicable to approved chemistry electives. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only.

CHEM 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. 2 units only applicable to approved chemistry electives. Major credit limited to 4 units; total credit limited to 24 units. Credit/No Credit grading only.

CHEM 500. Special Problems for Graduate Students. 1-3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter.

CHEM 528. Nutritional Biochemistry. 3 units

Term Typically Offered: W

Prerequisite: CHEM 313 or CHEM 372 or consent of instructor.

Nutritional aspects of biochemistry. Lecture, library research and student presentations. Topics include vitamins and minerals, essential and energy providing nutrients, deficiency, degenerative and genetic diseases of metabolism. Emphasis on current research and controversy. 3 lectures.

CHEM 544. Polymer Physical Chemistry and Analysis. 3 units

Term Typically Offered: F

Prerequisite: CHEM 212/312 or CHEM 216/316 or equivalent; CHEM 351 or equivalent.

Physical properties of polymers and coatings and their measurement; molecular weight averages, glass transition, thermodynamics of polymers, viscoelastic properties, rheology; molecular weight determination, thermal analysis, spectroscopic analysis, mechanical testing, atomic force microscopy. Special individual project. Not open to students with credit in CHEM 444. 3 lectures.

CHEM 545. Polymer Synthesis and Mechanisms. 3 units

Term Typically Offered: W

Prerequisite: CHEM 544.

Polymerization methods and mechanisms; chemistry of initiators, catalysts and inhibitors; use of representative types; synthesis, structure and properties of polymers commonly used in coatings and adhesives. Special individual project. Not open to students with credit in CHEM 445. 3 lectures.

CHEM 547. Polymer Characterization and Analysis Laboratory. 2 units

Term Typically Offered: F

Corequisite: CHEM 544.

Polymer characterization and analysis. Molecular weight analysis using viscometry, light scattering, and gel permeation chromatography. Thermal analysis using differential scanning calorimetry, thermal mechanical analysis and dynamic mechanical analysis. Polymer rheology. Infrared, Raman and FT-NMR spectroscopy. Atomic force microscopy. Special individual project. Not open to students with credit in CHEM 447. 2 laboratories.

CHEM 548. Polymer Synthesis Laboratory. 2 units

Term Typically Offered: W

Prerequisite: CHEM 547. Corequisite: CHEM 545.

Polymer synthesis using solution, suspension, bulk, emulsion techniques. Synthesis of chain growth polymers using free radical, anionic, cationic, and other catalysts. Synthesis of step-growth polymers. Kinetics of polymer reactions. Synthesis of resins used in modern coatings. Special individual project. Not open to students with credit in CHEM 448. 2 laboratories.

CHEM 550. Coatings Formulation Principles. 3 units

Term Typically Offered: SP

Prerequisite: CHEM 444 or CHEM 544.

Formulation of modern coatings. Raw materials including resins, solvents, pigments, and additives. Formulation principles for solvent-borne and high solids coatings, water-borne coatings, powder coatings, radiation cure coatings and architectural coatings. Regulatory issues; VOC's. Coating properties, film formation, film defects, application methods, color and color acceptance. Special individual project. 3 lectures.

CHEM 551. Coatings Formulation Laboratory. 2 units

Term Typically Offered: SP

Corequisite: CHEM 550.

Laboratory formulation of modern coatings. Formation of pigment dispersions. Formulation of solvent-borne and high solids coatings, water-borne coatings, powder coatings, radiation cure coatings and architectural coatings. VOC measurements. Measurement of coating properties, film formation, film defects, application methods, color and color acceptance, hiding, gloss. Accelerated weathering. Special individual project. 2 laboratories.

CHEM 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

CHEM 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

CHEM 590. Graduate Seminar in Polymers and Coatings. 1 unit

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing in the Polymers and Coatings program or consent of instructor.

Problems and topics in polymers and coatings selected according to the interest and needs of the students enrolled. Total credit limited to 3 units. 1 seminar.

CHEM 598. Graduate Project. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CHEM 545, CHEM 547, CHEM 548, CHEM 550, CHEM 551.

Supervised industrial graduate internship in polymers and coatings science. Provides students with industrial research experience. Requires approval of graduate advisor. Students engage in industrial research and development at an approved industry, make regular reports back to graduate advisor, and present formal report and seminar on work each quarter. Total credit limited to 9 units.

CHEM 599. Graduate Thesis. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CHEM 545, CHEM 547, CHEM 548, CHEM 550, CHEM 551.

Directed graduate research in specialized advanced topics related to polymers and coatings science, leading to a graduate thesis of suitable quality. Requires approval of graduate advisor. Students are expected to work independently and report weekly to faculty advisor. Total credit limited to 9 units.

Child Development (CD)

CD Courses

CD 102. Orientation to the Child Development Major. 2 units

Term Typically Offered: F

Prerequisite: CD majors only.

Introduction to the child development major, self-assessments, career opportunities, university and community resources, and the program at Cal Poly. 2 lectures.

CD 131. Observing and Interacting with Children. 4 units

Term Typically Offered: F, SP

Observation methods and guidance techniques for adults working with children in family, community, and educational settings. 3 lectures, 1 activity.

CD 200. Special Problems. 1-4 units

Term Typically Offered: TBD

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 6 units, with a maximum of 4 units per quarter.

CD 207. Children's Learning and Development in Educational Settings. 4 units

Term Typically Offered: TBD

Prerequisite: Sophomore standing; PSY 201 or PSY 202 or admission to the university with the intent to enter the MSTEP Program.

Study of theories and research about the development and learning of children and young adolescents within diverse backgrounds, and application to teaching in public school settings. Observations/interactions with children in school settings. 3 lectures, 1 activity. Participation in public schools requires mandated fingerprint clearance. Crosslisted as CD/EDUC 207.

CD 230. Preschool Laboratory. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CD 131 and PSY 256.

Preliminary teaching experience with children in a preschool laboratory setting. Participant planning, execution and evaluation of age-appropriate activities. Observation is used as the basis for planning for the development of the whole child. 2 lecture, 2 laboratories.

CD 254. Family Psychology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202.

Introduction to research and theory on family relationships and behavior across the lifespan. Contextual influences, diversity of family forms, and topics such as love, mate selection, marital quality, parenting, gender, household work, divorce, and remarriage. 4 lectures. Crosslisted as CD/PSY 254.

CD 256. Developmental Psychology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202.

Introduction to the scientific study of development with emphasis on the lifespan, from infancy to old age. Basic research and concepts in understanding social, emotional, cognitive, contextual, and diversity influences on development. 4 lectures. Crosslisted as CD/PSY 256.

CD 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

CD 304. Infant and Toddler Development. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 256.

Human development from conception through the second year of life. Examination of theory and research in multiple domains of development. Consideration of environments and activities which enhance the emerging capabilities of infants and toddlers. 4 lectures.

CD 305. Early and Middle Childhood Development. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 256 or CD/EDUC 207.

In-depth study of theory and research on development in early and middle childhood, especially within physical, cognitive, social, and emotional domains. Consideration of case studies and current practices in light of theoretical perspectives and current research. 4 lectures.

CD 306. Adolescence. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 256 or CD/EDUC 207.

Psychological analysis of the years from prepubescence to young adulthood. Current research on behavior and development during adolescence with emphasis on physical, affective, cognitive, sociocultural, historical, family, peer and school aspects of life during the post-child, pre-adult years. 4 lectures. Crosslisted as CD/PSY 306.

CD 329. Research Methods in Child Development. 4 units

Term Typically Offered: F, W

Prerequisite: PSY 256, STAT 217.

Introduction to research methods in child development. Critically evaluating research literature, generating research questions, and conducting observations and interviews with children and adolescents. 3 lectures, 1 activity.

CD 330. Supervised Fieldwork Internship. 4 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Psychology and Child Development majors only; CD 230, PSY 323, junior standing and consent of instructor.

Faculty supervised fieldwork experience. Role of professional apprentice is experienced and analyzed by each student. Credit/No Credit grading only.

CD 333. Research Internship. 4 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: CD 230 and CD 329.

Faculty-supervised research experience on various topics related to child and adolescent development. Student apprenticeship with a department faculty member engaging in a research project. Credit/No Credit grading only.

CD 350. Developmental Issues in Education. 4 units

Term Typically Offered: F, SP

Prerequisite: CD/EDUC 207 or PSY 256.

Current issues and research concerning how children and youth develop and learn in school. Topics may include motivation, views of intelligence, teacher and student relations, constructivist learning environments, socioemotional learning, school climates, home-school connections. 4 lectures.

CD 351. Learning in Out-of-School Time. 4 units

Term Typically Offered: W

Prerequisite: CD/PSY 256 or CD/EDUC 207.

How children and youth develop and learn in settings and activities outside of formal schooling, such as everyday family activities, informal learning institutions (e.g., museums), nature, and organized extracurricular activities. Research findings and theoretical perspectives on how activity in such settings supports development and learning. 4 lectures.

CD 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 6 units, with a maximum of 4 units per quarter.

CD 401. Perspectives on Child and Adolescent Development. 4 units

Term Typically Offered: W, SP

Prerequisite: CD 304, CD 305, CD 306, CD 329 and senior standing.

Advanced study of theoretical perspectives and research on the development of children and adolescents and the implications for current practice and policy. 4 seminars.

CD 413. Children, Adolescents & Technology. 6 units

Term Typically Offered: F, W, SP

Prerequisite: CD 305, CD 306, CD 329.

Examination of research and theory on how children and adolescents use digital technologies and influences on cognitive, social, and identity development. Observations of children's use of various digital technologies, and design of activities that use technology tools to support learning goals. 4 lectures, 2 laboratories.

CD 417. Interpersonal Relationships in Childhood and Adolescence. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CD 304, CD 305 or CD 306; or PSY 256 and PSY 305.

Current theories and research on the development of interpersonal relationships in childhood and adolescence. Topics may include parent-child relationships, peer relationships in childhood, intimate relationships in adolescence. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Crosslisted as CD/PSY 417.

CD 424. Children's Learning and Development in Diverse Families and Communities. 4 units

Term Typically Offered: F, W

Prerequisite: Two of the following: CD 304, CD 305, CD 306; junior standing or consent of instructor.

Examination of research on child and adolescent learning and development in diverse families and community settings. Further study of ecological and sociocultural perspectives and cross-cultural research. 4 lectures.

CD 430. Advanced Supervised Fieldwork Internship. 4 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: CD 330 and consent of instructor; Psychology and Child Development majors only.

Faculty-supervised preprofessional experience in a career-related setting which complements the CD 330 internship. Such roles as master teacher, caseworker, therapeutic intern, administrative aide or program specialist are experienced and analyzed by each student. Credit/No credit grading only.

CD 431. Assessing Children's Development and Environments. 4 units

Term Typically Offered: F, W

Prerequisite: CD 304 or CD 305 or PSY 419 or PSY 420 or PSY 421; and CD 329 or PSY 329.

Current developmental and environmental assessments used in care and educational settings and in prevention programs and research. Practice using, creating, and evaluating child assessments. 3 lectures, 1 activity. Crosslisted as CD/PSY 431.

CD 433. Advanced Research Internship. 4 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: CD 333.

Faculty-supervised research experience on various topics related to child and adolescent development. Student apprenticeship with a department faculty member to conduct aspects of a research project. Credit/No Credit grading only.

CD 456. Behavioral Disorders in Childhood. 4 units

Term Typically Offered: SP

Prerequisite: PSY 201 or PSY 202, junior standing.

Applications of psychological principles to childhood behavioral disorders. Aggression, delinquency, stress reactions, motivational, perceptual-attentional deficiencies, psychoses, anxiety disorders, biological dysfunctions, and social, emotional and intellectual disabilities. 4 seminars. Crosslisted as CD/PSY 456.

CD 460. Child Abuse and Neglect. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202 and junior standing.

Issues in child maltreatment, including definitions and forms, causes, consequences, assessment, reporting, treatment, and prevention. Possible links among research, intervention, and public policy will be emphasized. 4 seminars. Crosslisted as CD/PSY 460.

CD 461. Senior Project Seminar. 2 units

Term Typically Offered: F, W

Prerequisite: Completion of GWR and CD 329; Psychology and Child Development majors only.

Senior project expectations and skills. Students work alone or in groups to identify appropriate topics, methods and content for the senior project; to be presented in a series of progress reports. Begin literature reviews for completion in CD 462. 2 seminars.

CD 462. Senior Project. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CD 461.

Completion of a project under faculty supervision.

CD 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 lectures.

Chinese (CHIN)

CHIN Courses

CHIN 101. Elementary Mandarin Chinese I. 4 units

Term Typically Offered: F

Beginning Mandarin Chinese. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing and introduction to Chinese culture. 3 lectures, 1 activity.

CHIN 102. Elementary Mandarin Chinese II. 4 units

Term Typically Offered: W

Prerequisite: CHIN 101 or appropriate score on placement exam or consent of instructor.

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing and introduction to Chinese culture. To be taken in numerical sequence. 3 lectures, 1 activity.

CHIN 103. Elementary Mandarin Chinese III. 4 units

Term Typically Offered: SP

Prerequisite: CHIN 102 or appropriate score on placement exam or consent of instructor.

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing and introduction to Chinese culture. To be taken in numerical sequence. 3 lectures, 1 activity.

CHIN 201. Intermediate Mandarin Chinese I. 4 units

GE Area C5

Term Typically Offered: F

Prerequisite: CHIN 103 or appropriate score on placement exam or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in Mandarin Chinese within an intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Fulfills GE C5.

CHIN 202. Intermediate Mandarin Chinese II. 4 units

GE Area C5

Term Typically Offered: W

Prerequisite: CHIN 201 or appropriate score on placement exam or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in Mandarin Chinese within an intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Fulfills GE C5.

CHIN 203. Intermediate Mandarin Chinese III. 4 units

GE Area C5

Term Typically Offered: SP

Prerequisite: CHIN 202 or appropriate score on placement exam or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in Mandarin Chinese within an intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Fulfills GE C5.

City and Regional Planning (CRP)

CRP Courses

CRP 101. Introduction to the Profession of City and Regional Planning. 1 unit

CR/NC

Term Typically Offered: TBD

Introduction to what professional planners do in the public and private sectors and how they help manage growth and change. Credit/No Credit grading only. 1 lecture.

CRP 201. Basic Graphic Skills. 4 units

Term Typically Offered: F

Basic techniques used in graphic communication for representation of the real world on two-dimensional planes. Use of scale, drawing conventions, orthographic and isometric projections, perspective drawings. Basic design and site analysis skills. Sketching, delineation and rendering including the use of black and white and color techniques. 4 laboratories.

CRP 202. Urban Design Studio I. 4 units

Term Typically Offered: W

Prerequisite: CRP 201, CRP 211 or consent of instructor.

Exploring elements and principles of environmental design. Understanding the form and character of the designed urban environment. Introduction to problem analysis and problem solving in environmental design. Implications of design decisions and solutions on urban context. Assignments of object, project and system scale in an urban context. 4 laboratories.

CRP 203. Urban Design Studio II. 4 units

Term Typically Offered: SP

Prerequisite: CRP 202.

Applications of basic design fundamentals and skills to the design of environments through design exercises applied to planning. Problem analysis and problem solving skills as applied to environmental design issues. 4 laboratories.

CRP 204. Theories and Methods of Urban Design. 3 units

Term Typically Offered: W

Prerequisite: CRP 201.

Definition/nature of urban design: a typology of procedures and products. Urban design as a field between planning, architecture, and landscape architecture. Visual assessment and townscape movement. Environmental perception, behavior and spatial fit. Typo-morphology and the architecture of the city. 1 lecture, 2 activities.

CRP 211. Cities: Form, Culture and Evolution. 4 units

Term Typically Offered: W

Historical overview of the evolution of cities - how the form and function of cities evolved among different societies from antiquity to contemporary times. Includes early cities in Mesopotamia, Central America; Greece and Rome; Renaissance, Baroque; and North and South America. 4 lectures.

CRP 212. Introduction to Urban Planning. 4 units

Term Typically Offered: F, W, SP

Understanding the issues of contemporary urban growth and change. Development of theories of urban planning and design. Introduction to zoning, planning regulations and codes, and professional practice. Relationship of environmental design disciplines, citizen groups, and individuals to urban planning. 4 lectures.

CRP 213. Population, Housing and Economic Applications. 4 units

Term Typically Offered: F

Prerequisite: CRP 212.

Collection, organization, and presentation of information and data related to population, housing and employment. Analytical applications to estimate population over time, housing demand by type and income and employment by standard classification. Application of urban economic theory related to jobs and housing. 3 lectures, 1 laboratory.

CRP 214. Land Use and Transportation Studies. 4 units

Term Typically Offered: SP

Prerequisite: CRP 212.

How cities and regions work. Relationship between human activities and patterns of land use and circulation. Spatial analysis and location theories. Methods for conducting studies to describe, analyze, and map land uses. Regional-scale transportation analysis, traffic impact studies, and multimodal transportation plans. 3 lectures, 1 activity.

CRP 215. Planning for and with Multiple Publics. 4 units

USCP

Term Typically Offered: SP

Prerequisite: Completion of GE Area D1. Recommended: ES 112.

How the social/spatial relationships among racial/ethnic and gender groups are expressed in terms of human settlement patterns, civic involvement and everyday negotiations. Ways in which segregation and marginalization are expressed in western and non-western contexts. 4 lectures. Crosslisted as CRP/ES 215. Fulfills USCP.

CRP 216. Computer Applications for Planning. 2 units

Term Typically Offered: F

Introduction to the use of computer applications for planners. Includes spreadsheets, statistical applications, database, geographic information systems, and graphics. 1 lecture, 1 laboratory.

CRP 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

CRP 304. Intergroup Dialogues. 4 units

GE Area D5

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area D1, D3, or D4. Recommended: Completion of USCP.

Weekly meetings of students from two distinct self-defined identity groups, with trained peer facilitators, in which readings, experiential activities, informed dialogue, and reflective writing are integrated as a means of encouraging self and group awareness and exploring ways to promote just community across difference. Supplemented by weekly lecture/discussions. 2 lectures, 2 discussions. Crosslisted as CRP/PSY 304. Fulfills GE D5 except for the following majors: City and Regional Planning, Child Development, and Psychology.

CRP 314. Planning Theory. 4 units

Term Typically Offered: W

Prerequisite: CRP 212.

Theories of planning. Role of planner in society, purpose of planning, administrative framework in which planning takes place. Alternative approaches to planning, values, ethics in planning. Activities aimed at exploring communicative and participatory aspects of planning theory. 3 lectures, 1 activity.

CRP 315. Fiscal and Project Feasibility. 4 units

Term Typically Offered: W

Prerequisite: Completion of GE Area D2.

Analysis of the revenue streams and costs involved in project development. Impact analysis of costs and revenues on private and public sectors included. Construction of pro-formas for various project types. 3 lectures, 1 laboratory.

CRP 325. Reflections on Biking, Walking and the City. 4 units

GE Area D5

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in GE Area D.

Study of the design of cities for walking and bicycling and its importance to the future of transportation and the resilience of cities. Reflection on how bicycles and pedestrians shape the urban environment through literature, music, policy, and design practices. 4 lectures. Fulfills GE D5 except for City and Regional Planning majors.

CRP 334. Cities in a Global World. 4 units

GE Area D5

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and two courses from D1, D2, D3, D4.

Examination of the changes in the social and spatial organization of urban settlements in the twenty-first century caused by the urbanization and globalization processes. Comparative analysis of the traditional and contemporary cities in the Pacific Rim, South America and Eastern Europe. 4 lectures. Fulfills GE D5 except for City and Regional Planning majors.

CRP 336. Introduction to Environmental Planning. 4 units

Term Typically Offered: F

Prerequisite: CRP 212.

Examination of the challenges that arise when human and natural systems interact and the tools planners have to manage this interaction. Relevant principles from a variety of disciplines are used to assess environmental problems and identify solutions in human-dominated systems. 4 lectures.

CRP 338. Digital Cities. 4 units

GE Area F

Term Typically Offered: W, SP

Prerequisite: Junior standing; completion of GE Area B.

Explores changes in urban form and urban experience associated with advances in digital technology. Implications for the design of places and the distribution of economic and social benefit. Lecture-discussions and opportunities to explore technology initiatives in community building. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE Area F.

CRP 339. Disaster-Resistant Sustainable Communities. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B.

Creation of safer, more resilient cities through systematic application of urban disaster risk reduction methods that utilize the technology of GIS combined with principles from the engineering and geo-sciences. Emphasis on hazard identification and methods to lower disaster risk. 3 lectures, 1 activity. Fulfills GE Area F.

CRP 341. Urban Design Studio III. 4 units

Term Typically Offered: SP

Prerequisite: CRP 203, CRP 213, or CRP 214.

Urban design theories and methods related to planning and urban development. Integration of circulation, environmental, land-use, and design aspects. Infill or new development projects at the scale of a neighborhood, large PUD, complex circulation corridor, small town or planned community. 4 laboratories.

CRP 342. Environmental Planning Methods. 4 units

Term Typically Offered: W

Prerequisite: CRP 336.

Case studies and applications of theory and methods to regional and environmental systems. Interrelationships between natural, economic, and social and political systems. Application of California Environmental Quality Act and environmental impact assessment methods. Environmental equity and sustainable bioregions. 2 lectures, 2 laboratories.

CRP 351. Introduction to Emergency Management in California. 3 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area B3 or D.

Emergency management emphasizing the Standardized Emergency Management System (SEMS) and Emergency Operations Center (EOC) operations. Earthquake hazard used as the case to explore potential wide geographic impacts, multiple secondary hazards, and multidisciplinary problem-solving methods in natural disasters faced by local governments and communities. 2 lectures, 1 activity. Crosslisted as CRP/NR 351.

CRP 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual or group investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

CRP 401. Disaster Recovery. 3 units

Term Typically Offered: TBD

Prerequisite: CRP/NR 351.

Strategies and procedures for public sector management of recovery from disasters. Understanding the role of, and relationship between, federal, state and local agencies to provide assistance to individuals and communities in the post-disaster environment. Issues in the recovery process. 2 lectures, 1 activity. Crosslisted as CRP/NR 401.

CRP 402. Contemporary Urban Design. 4 units

Term Typically Offered: F

Prerequisite: Completion of GE Area A1 with a grade of C- or better and CRP 341; or graduate standing.

Study of contemporary urban design through the detailed examination of major city/country case studies. Analysis of the cultural, social and political factors influencing the practice of urban design and its major trends in different countries. 4 lectures.

CRP 404. Environmental Law. 3 units

Term Typically Offered: SP

Prerequisite: Junior standing.

Detailed examination of the law governing use and protection of natural resources with focus on the legal institutions entrusted with the public duty of protecting the environment. 3 lectures. Crosslisted as CRP/NR 404.

CRP 408. Water Resource Law and Policy. 3 units

Term Typically Offered: W

Prerequisite: Junior standing.

Detailed examination of the various legal systems of water use, regulation and management in California and the United States. Discussion on the key concepts and principles of state, federal and interstate water quantity and quality control; focusing on issues and problems, why conflicts occur and how solutions evolve. 3 lectures. Crosslisted as CRP/NR 408.

CRP 409. Planning Internship. 2 units

CR/NC

Term Typically Offered: F, SP

Prerequisite: Consent of instructor.

Work experience as a supervised employee in a planning-related agency or private firm. Prior contract specifying the product of internship required between student, agency and faculty. Sixty hours work experience for two units of credit. Credit/No Credit grading.

CRP 410. Community Planning Laboratory I. 4 units

Term Typically Offered: F

Prerequisite: CRP 336, CRP 341 or consent of instructor.

Application of planning theory and methods to the analysis and creation of community plans. Interrelationships in the natural and built environments related to land use, circulation, social and other conditions. Includes field trips and individual, team and interdisciplinary approaches. 4 laboratories.

CRP 411. Community Planning Lab II. 4 units

Term Typically Offered: W

Prerequisite: CRP 342, CRP 410, or consent of instructor.

Continuation of CRP 410. Application of planning theory and methods to the analysis and creation of community plans. Interrelationships in the natural and built environments related to land use, circulation, social and other conditions. Includes field trips and individual, team and interdisciplinary approaches. 4 laboratories.

CRP 412. Plan Implementation. 4 units

Term Typically Offered: SP

Prerequisite: CRP 212.

Theory and practice of plan implementation. Regulation and nonregulatory approaches to plan implementation, including development regulation, economic development, growth management, habitat conservation planning, capital improvement planning, redevelopment programs, and transportation system management. The California Specific Plan will serve as the course model. 4 lectures.

CRP 420. Land Use Law. 4 units

Term Typically Offered: F

Prerequisite: CRP 212 and upper division standing.

Public controls protecting natural environmental systems. Land use and environmental controls. Review of control mechanisms. State and federal legislation. Legal implications of controls, public planning and policy issues. 4 lectures.

CRP 426. Planning Healthy Communities. 4 units

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of two lower division courses in GE Area D.

Introduction to advanced topics on the relationship between the built environment and public health, assessment methods, and planning approaches to creating healthier communities. 4 lectures.

CRP 428. International Planning and Development. 4 units

Term Typically Offered: W

Prerequisite: Junior standing. Recommended: CRP 334.

Comparative assessment of planning for international development to improve the quality of life of people in cities and regions around the world. Critical analysis of theories and practices underlying programs and projects and their pertinence to the United States. 4 lectures.

CRP 430. Professional Planning Practice. 3 units

Term Typically Offered: W

Prerequisite: CRP 212.

Relationships of planning organizations to other governmental bodies, public agencies and citizen groups. Working in a public planning agency and private practice. Current topics in planning practice. 3 lectures.

CRP 435. Transportation Theory. 4 units

Term Typically Offered: F

Prerequisite: CRP 212, senior standing, or graduate standing.

Circulation and transportation elements of the General Plan. Transportation planning theory, methods and tools related to systematic analysis of city and regional transportation problems including environmental impact assessment. Application of techniques for assessing transportation systems, gravity models, route selections, land use models and relationship to transportation. 3 seminars, 1 activity.

CRP 436. Collaborative Planning. 4 units

Term Typically Offered: W

Prerequisite: CRP 212 or graduate standing.

Focus on processes and skills of citizen participation and consensus building. Application of mediation and negotiation techniques. Use of collaboration in forming visions of the future and reaching agreements among multiple interests. Use of group process skills to establish effective communication and agreements. Organizing and operating public meetings. 3 lectures, 1 laboratory.

CRP 438. Pollution Prevention and Control. 4 units

Term Typically Offered: SP

Prerequisite: Senior standing or graduate standing.

Interdisciplinary exploration of policy and planning associated with pollution prevention and control, including institutional, legal, economic, political, social, and technology-related aspects. Includes hands-on activity in small groups. 4 lectures.

CRP 440. Climate Action Planning. 4 units

Term Typically Offered: F

Prerequisite: CRP 212 or graduate standing. Recommended: CRP 336.

Introduction of the planning role in reducing greenhouse gas emissions and adapting to climate change. Basic climate science, greenhouse gas emissions inventories, politics of climate change, and federal/state policy. Focus on development and implementation of local climate action plans. 4 lectures.

CRP 442. Housing and Planning. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing.

Understanding housing issues, policies and programs from a planning perspective. Analysis of the economic underpinnings of land markets and housing markets, housing plans, finance, public programs, affordable housing. 4 seminars.

CRP 445. Planning and Urban Ecology. 4 units

Term Typically Offered: SP

Prerequisite: Upper division or graduate standing.

Introduction to urban ecology as an organizing framework for addressing environmental problems. Provides the opportunity to explore an urban ecological research question through quantitative stream assessment and qualitative social survey data collection and analysis. 3 lectures, 1 laboratory.

CRP 446. Development Review and Entitlement. 4 units

Term Typically Offered: SP

Prerequisite: Upper division standing or graduate standing.

Application of zoning regulations, subdivision ordinances, design standards, building codes, exactions, fees, and related requirements within the development review process leading to land use entitlement. Land development is evaluated from permit application submittal to condition compliance during the plan check, construction, and operational phases of a project. 4 lectures.

CRP 448. Principles of Urban Design. 4 units

Term Typically Offered: W

Prerequisite: CRP 341 or graduate standing.

Introduction to philosophies and theories of urban design. Holistic comprehension of forces generating the city form. Exploration of evaluation criteria and critical analysis of the built environment. Cultural, economic, political, behavioral, visual, perceptual, and morphological aspects of urban form. 4 seminars.

CRP 452. Community Design Methods. 4 units

Term Typically Offered: F

Prerequisite: CRP 201 and CRP 202, Upper division or graduate standing.

Introduction to community design as an interdisciplinary subject. Focus on the active involvement of end-users in the creation and management of built environments. Principles and techniques of participatory design and planning, including charrettes, design games and participatory technologies. Demonstration of participatory techniques through case studies and application. 3 lectures, 1 laboratory.

CRP 456. Web Technologies for Planning. 2 units

Term Typically Offered: SP

Prerequisite: CRP 212, or graduate standing.

Introduction to the use of web technologies for planning and community engagement. Includes web publishing, mapping, surveys, video, collaboration and social media tools. Course may be offered in classroom-based or online format. 2 lectures.

CRP 457. GIS Applications in Planning. 3 units

Term Typically Offered: F

Prerequisite: CRP 216 and junior standing, or graduate standing.

GIS applications using computer-based systems in gathering, managing and analyzing information pertinent to planning. Development of skills in systematic data acquisition, processing and maintenance with applied planning problems within the convenient medium of GIS and general information systems. 2 seminars, 1 laboratory.

CRP 458. Local Hazard Mitigation Planning and Design. 4 units

Term Typically Offered: F

Prerequisite: GE Areas D2, D3 and F or graduate standing.

Creation of safer, more resilient cities through systematic application of urban disaster risk reduction and regeneration planning principles and methods. Integration of insights from the design, resource management, and urban administration professions for minimizing disaster losses and improving recovery activities. 4 lectures.

CRP 461. Senior Project I. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CRP 341, CRP 342.

Research and problem analysis in planning. Selection and completion of a project under faculty supervision. Projects typical of problems addressed in planning practice. Project results presented in a formal report. To be completed in two quarters. Minimum 120 hours time.

CRP 462. Senior Project II. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CRP 410.

Research and problem analysis in planning. Selection and completion of a project under faculty supervision. Projects typical of problems addressed in planning practice. Project results presented in a formal report. To be completed in two quarters. Minimum 120 hours time.

CRP 463. Senior Project Professional Practice. 4 units

Term Typically Offered: SP

Prerequisite: CRP 410 and senior standing.

Practical applications of city and regional planning theory and practice solving problems related to the built environment. Assembly of project documents and reports that meet the senior project requirement. 4 seminars.

CRP 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

CRP 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

CRP 472. Planning Colloquium. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Upper division standing or graduate standing.

Lecture and discussion by faculty members and invited guests on controversial or topical planning related subject matter at campus and/or off-campus locations. Topics to be announced in advance by CRP Department. Total credit limited to 3 units. Credit/No Credit grading only. 1 seminar.

CRP 483. Special Studies in City and Regional Planning. 1-12 units

Term Typically Offered: F, W, SP

Prerequisite: Upper division or graduate standing.

Study of special issues and problems through field research and other forms of investigation and involvement in an off-campus setting. Requirements determined prior to individual project through contractual arrangement between the student and the department. Departmental Off-Campus Study Program guidelines apply. The Schedule of Classes will list topic selected.

CRP 500. Individual Study. 2-3 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing with minimum of 12 core units.

Independent research, studies, or surveys of selected subjects. Total credit limited to 9 units.

CRP 501. Foundations of Cities and Planning. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing.

Origins and evolutionary stages of settlement patterns and the use of land and natural environment. Changing spatial structure in the development of cities and regions. Beginnings and the historical development of the planning profession. 4 lectures.

CRP 504. Sustainable Communities. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing.

Introduction to the theory and practice of sustainable communities. Addresses creating communities that foster economic and environmental health, social equity, and citizen participation. Promotes comprehensive planning through urban design, transportation, environment, and community development. Includes hands-on learning and field study. 3 seminars, 1 laboratory.

CRP 509. Professional Development. 1-3 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Professional development course, including environmental assessment workshop, applied research workshop, internship seminar, and other events. Total credit limited to 3 units. Credit/No Credit grading only. 1-3 activities.

CRP 510. Planning Theory. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Theory of planning. Development of contemporary planning thought from varying sources and perspectives. Political and social context of planning. Alternative professional roles, and planning processes. Values and ethical issues in planning. 4 seminars.

CRP 512. Introduction to Visual Communication and GIS. 4 units

CR/NC

Term Typically Offered: W

Prerequisite: Graduate standing.

Introduction to geographic information systems (GIS) as a tool for analyzing and managing spatial information pertinent to planning. Introduction to various drawing media and delineation techniques for planners, including three-dimensional visualization and graphic skills. Integration of visual and digital media in presentations. Credit/No Credit grading only. 4 laboratories.

CRP 513. Planning Research and Analysis. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing.

Application of research design to planning issues. Comparison of case study, comparative and problem-solving methods. Primary and secondary data sources, including field survey techniques. 4 seminars.

CRP 516. Demographic and Analytic Tools. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing or consent of instructor.

Problem recognition, data selection, analysis and synthesis with applications of system design, statistical techniques and symbolic modeling to urban design and regional growth and development policies. 3 seminars, 1 laboratory.

CRP 518. Policy Development. 4 units

Term Typically Offered: F

Prerequisite: CRP 501.

Analysis of the social, economic, environmental, political contexts of public policy decisions. Public policy issues and use of concepts and tools related to monitoring and assessment. 4 lectures.

CRP 520. Feasibility Studies. 4 units

Term Typically Offered: SP

Prerequisite: CRP 501 or consent of instructor.

Fundamental analysis for assessing feasibility of public and private development projects. Principles and techniques for analyzing markets and assessing cash flow for individual projects. Economic, fiscal and tax impacts as factors determining public participation in private projects. 4 seminars.

CRP 525. Plan Implementation. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor.

Theory and practice of plan implementation. Regulatory and non-regulatory frameworks for plan implementation. Growth management, development regulation, capital improvement programs, redevelopment. 4 seminars.

CRP 530. Planning Agency Management. 4 units

Term Typically Offered: SP

Prerequisite: CRP 501 or graduate standing.

Preparation for professional practice in public planning agencies and private firms. Applications of organization theory to planning agencies and firms. Work programs, staff development, budgets, contracting, proposal preparation, conflict management. Relationships with other agencies and firms, clients, public and media. 4 seminars.

CRP 535. Land Use and Planning Law. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing, or consent of instructor.

The role of law in the planning and regulation of land use. Constitutional constraints on land use regulation. Legal and policy issues for environmental protection and public administration. Relevant legislation and case law. 4 lectures.

CRP 545. Principles of Environmental Planning. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing or consent of instructor.

Environmental planning as a field of inquiry and action. Several parallel streams of knowledge are pursued: environmental planning theory; ecological process and assessment in human-dominated settings; environmental impact assessment; and the review and application of environmental planning tools. 3 seminars, 1 laboratory.

CRP 552. Community and Regional Planning Studio I. 4 units

Term Typically Offered: F

Prerequisite: CRP 501, CRP 525, or consent of instructor.

Application of planning theory and methods to community and regional planning projects. Structured for research, analysis, synthesis, and implementation practice. Interrelationships of natural and built environments, transportation systems, and economic and social conditions at various planning scales. Includes field trips and individual, team and interdisciplinary approaches. 2 seminars, 2 laboratories.

CRP 553. Project Planning and Design Studio. 4 units

Term Typically Offered: SP

Prerequisite: CRP 512 or consent of instructor.

Project-scale planning problems. Arranging structures, circulation systems, utilities and plant material on natural and urban sites to support human activity while minimizing disruption to natural systems. Includes planned unit developments, waterfronts, hillsides, campuses and commercial centers. Field trips. 4 laboratories.

CRP 554. Community and Regional Planning Studio II. 4 units

Term Typically Offered: W

Prerequisite: CRP 552.

Application of planning theory and methods to community and regional planning projects. Structured for research, analysis, synthesis, and implementation practice. Interrelationships of natural and built environments, transportation systems, and economic and social conditions at various planning scales. Includes field trips, and individual, team and interdisciplinary approaches. 2 seminars, 2 laboratories.

CRP 556. Community and Regional Planning Studio III. 4 units

Term Typically Offered: SP

Prerequisite: CRP 554, or consent of instructor.

Application of planning theory and methods to community and regional planning projects. Individual faculty-assigned laboratory work leading to the completion of a professional quality project focused on a real-world planning task. Structured for research, analysis, synthesis and implementation practice. 3 seminars and supervised work.

CRP 570. Selected Topics in Planning. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected planning topics. Total credit limited to 12 units. 4 seminars.

CRP 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

CRP 596. Professional Project. 2-4 units

Term Typically Offered: F, W, SP

Prerequisite: CRP 513, and consent of the graduate program coordinator.

Individual research under the supervision of the faculty, leading to completion of a professional project based on a real world planning task or carefully constructed simulation. Must be taken in all quarters requiring supervision; minimum of 6 units required for degree. Total credit limited to 8 units.

CRP 599. Thesis. 2-4 units

Term Typically Offered: F, W, SP

Prerequisite: CRP 513, and consent of the graduate program coordinator.

Individual research under the general supervision of the faculty, leading to a graduate thesis. Must be taken in all quarters requiring supervision; minimum of 6 units required for degree. Total credit limited to 8 units.

Civil Engineering (CE)

CE Courses

CE 111. Introduction to Civil Engineering. 1 unit

CR/NC

Term Typically Offered: F

Broad overview of the field of civil engineering, including professional societies and their student chapters, professional licensing and registration, professional codes of ethics, the elements of engineering design, and the scope of analysis and design activities undertaken by private- and public-sector civil design professionals. Credit/No Credit grading only. 1 lecture.

CE 112. Design Principles in Civil Engineering. 2 units

Term Typically Offered: W

Prerequisite: MATH 141.

The civil and environmental engineering design process. Illustration and quantification of design alternatives. Practice in creating and evaluating typical designs drawn from different specialty areas of the field. 2 lectures.

CE 113. Computer Aided Drafting in Civil Engineering. 2 units

Term Typically Offered: F, W, SP

Computer-aided drawing (CAD) and related software to display and quantify engineering designs. Elements of engineering design drawings. Related topics in information technology. 2 laboratories.

CE 200. Special Problems. 1-2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading only.

CE 204. Mechanics of Materials I. 3 units

Term Typically Offered: F, W, SP

Prerequisite: ME 211.

Stresses, strains, and deformations associated with axial, torsional, and flexural loading of bars, shafts, and beams. Analysis of elementary determinate and indeterminate mechanical and structural systems. 2 lectures, 1 activity.

CE 207. Mechanics of Materials II. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CE 204.

Combined stress states including torsion, axial, shear, moment, and pressure vessel loadings. Principle stress/strain states. Basic failure criteria. Analysis of beam forces, moments, deflections, and rotations. Introduction to stability concepts including column buckling. 1 lecture, 1 activity.

CE 251. Programming Applications in Engineering. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CE 113, CE 204 and MATH 244.

Concepts from basic programming theory introduced in the context of engineering applications. Topics include the application of programming constructs to demonstrate finite precision calculations, linear systems, linear programming, basic nonlinear systems, plotting, statistics, least squares, approximations, and solve related problems from civil and environmental engineering. 2 activities.

CE 259. Civil Engineering Materials. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CE 204.

Experimental determination of mechanical properties of concrete, asphalt, and soils as required for engineering applications. Experimental verification of assumptions made in mechanics of materials procedures. Use of strain measuring devices. Preparation of technical reports. 2 laboratories.

CE 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

CE 321. Fundamentals of Transportation Engineering. 3 units

Term Typically Offered: F, W, SP

Prerequisite: PHYS 141; CE 259 or graduate standing.

The characteristics and functions of highway, air, rail, transit and other modes of urban and intercity transportation. Fundamentals of transportation design, operations, and planning. Evaluation of costs, benefits, and environmental considerations. 3 lectures.

CE 322. Fundamentals of Transportation Engineering Laboratory. 2 units

Term Typically Offered: F, W, SP

Prerequisite or concurrent: CE 321.

Application of principles of transportation planning, operations, and design. Emphasis on urban transportation planning and operations, and the design of urban and intercity highway and rail facilities. Experimental determination of the physical and mechanical properties of pavement materials through laboratory and field testing. Analysis of data and preparation of testing reports. 2 laboratories.

CE 336. Water Resources Engineering. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ME 341 or ENVE 264. Concurrent: CE 337.

Hydraulics of pile flow. Open channel flow, groundwater, and hydrology. 4 lectures.

CE 337. Hydraulics Laboratory. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: ME 341 or ENVE 264. Concurrent: CE 336.

Application of basic fluid dynamic principles to various mechanical systems. Exposure to experimental problems and techniques with guided laboratory projects related to civil engineering discipline. 1 laboratory.

CE 352. Structural Engineering. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CE 207. Corequisite: CE 251.

Introduction to concepts of structural engineering including ASCE7 loads, vertical and lateral load path, flexible and rigid diaphragms, determinate vs indeterminate systems, and the use of computer programs to solve structural engineering problems. 3 lectures, 1 laboratory.

CE 355. Reinforced Concrete Design. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CE 259 and CE 352.

Analytical and design principles of reinforced concrete in designing civil engineering systems. Origin of code requirements. Fundamentals of proportioning. Details of elements and structural systems. 3 lectures, 1 laboratory.

CE 356. Structural Steel Design. 4 units

Term Typically Offered: F, SP

Prerequisite: CE 352.

Design and behavior of the elements of steel structures. Design and analysis of bolted, welded and eccentric connections. Proportioning of members and connections. Introduction to plastic design, end plate connection, composite construction, shear connections and design of composite beams. 3 lectures, 1 laboratory.

CE 371. Construction Management and Project Planning. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ARCE 106, CE 259 or CM 113.

Theory and practice of planning, scheduling, estimating, and reporting for construction projects. Fundamentals of scheduling logic including critical path, deterministic, and probabilistic scheduling; including the impact of constraints. Identifying resources and estimating time requirements for design activities and project operations. Not open to Architectural Engineering or Construction Management majors. 3 lectures, 1 activity. Crosslisted as CE/CM 371.

CE 381. Geotechnical Engineering. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CE 207; ME 341 or ENVE 264. Concurrent: CE 382 (CE majors only).

Engineering geology, elementary mass-volume relations, clay-water interaction, soil classification, soil compaction, geostatic stress distributions, 1-D and 2-D steady-state flow, shear strength under drained and undrained conditions. 4 lectures.

CE 382. Geotechnical Engineering Laboratory. 1 unit

Term Typically Offered: F, W, SP

Corequisite: CE 381.

Use of standard laboratory test methods to determine physical, mechanical, and hydraulic properties of soil. 1 laboratory.

CE 400. Special Problems. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

CE 401. Advanced Mechanics of Materials. 4 units

Term Typically Offered: TBD

Prerequisite: CE 406 or ME 328.

Introduction to linear elasticity as a means for development of reduced order theories such as torsion, beams, columns, and plates from the general three-dimensional continuum. Energy methods as well as the application and limitation of these theories. 4 lectures.

CE 404. Applied Finite Element Analysis. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BMED 410 and CE 207; or CE 406; or ME 328.

Finite element based solutions to engineering problems with an emphasis on elastostatic problems in structural mechanics. The power and pitfalls associated with the finite element method highlighted through practical modeling assignments. Introduces the use of commercial finite element codes. 3 lectures, 1 laboratory. Crosslisted as BMED/CE/ME 404.

CE 405. Concrete Materials. 4 units

Term Typically Offered: TBD

Prerequisite: CE 259.

Supplementary cementitious materials and chemical admixtures and their incorporation into concrete mix designs. Design and testing of concrete for durability and other specialized properties. 3 lectures, 1 laboratory.

CE 406. Structural Analysis. 5 units

Term Typically Offered: F

Prerequisite: CE 352.

Structural analysis of frames, trusses, and combined systems. Modern structural analysis theorems are presented along with discussion of their relation to classical methods. Specific topics include virtual forces, virtual displacements, compatibility, constraints and matrix formulations. Course may be offered in classroom-based or online format. 4 lectures, 1 laboratory.

CE 407. Structural Dynamics. 4 units

Term Typically Offered: W

Prerequisite: CE 406 and ME 212.

Effect of vibration and transient loads on structural elements. Dynamics load factors, support motion, damping and natural frequencies of multidimensional structural systems. Modal analysis. 3 lectures, 1 laboratory.

CE 413. Advanced Civil Computer-Aided Site Design. 2 units

Term Typically Offered: F, W

Prerequisite: BRAE 239 and CE 113.

Apply advanced CAD software to develop design techniques and convey the completed design on a set of plans; site coordination, basic road design, grading, and utility design. 2 laboratories.

CE 421. Traffic Engineering. 4 units

Term Typically Offered: F

Prerequisite: CE 321.

Principles of traffic circulation on highway systems and other modes. Traffic control. Traffic data collection and analysis. Capacity analysis. Traffic modeling. New technologies. 3 lectures, 1 laboratory.

CE 422. Highway Geometrics and Design. 4 units

Term Typically Offered: W

Prerequisite: CE 321.

Alignment location and safe geometric design of highways. Earthwork and drainage related to highway. Theory and practice in design of alignments, highway cross-sections, intersections, interchanges, and freeways in urban and rural areas. Application of advanced computer software to highway geometrics. 2 lectures, 2 laboratories.

CE 423. Intelligent Transportation Systems. 4 units

Term Typically Offered: SP

Prerequisite: CE 321 or graduate standing.

Specification and operation of Intelligent Transportation Systems (ITS). Traffic surveillance and control systems including applications to freeways, urban streets, rural highways, and public transportation. Standards include the National Architecture for ITS. 3 lectures, 1 laboratory.

CE 424. Public Transportation. 4 units

Term Typically Offered: W

Prerequisite: CE 321.

Interdisciplinary aspects of public transportation problems, systems-team design approach to solutions. History and present state of public transportation; role of public transportation in urban environment; legislative, political, social, and economic aspects of public transportation systems. Methodology and procedures for transit planning. Review of transit studies. 3 lectures, 1 laboratory.

CE 425. Introduction to Railway Engineering. 4 units

Term Typically Offered: SP

Prerequisite: CE 321, and CE 381.

Introduction to railroad and railway system analysis and design. Railroads, rail transit and high speed rail applications. Track foundation design for various conditions. Approaches to railway analysis and design and an introduction to railway traffic control and signaling. 4 lectures.

CE 431. Coastal Hydraulics I. 4 units

Term Typically Offered: W

Prerequisite: ME 341 or ENVE 264.

Waves and their characteristics, types of waves, water wave theories, orbital velocities, refraction of waves, wave diffraction, wave reflection, application of linear theory to wave forces on cylindrical structures, submerged pipelines and vertical flat barriers (sea walls), wave uprush, rubble mound breakwaters. 4 lectures.

CE 432. Coastal Hydraulics II. 4 units

Term Typically Offered: TBD

Prerequisite: CE 431.

Reformed breaker height determination, wave runup analysis using a reformed breaker height. Wave setback analysis. Pile height determination. Criteria for types of breaking waves. Revetment analysis, rip-rap revetment design, wave forces on pilings. 4 lectures.

CE 433. Open Channel Hydraulics. 4 units

Term Typically Offered: F

Prerequisite: CE 336.

Analysis and characteristics of flow in open channels; critical flows; uniform flow; gradually varied flow; channel design problems, channel transitions and controls. Rapidly varied flow; hydraulic jump and energy dissipaters. Unsteady flows, waves and wave propagation, flood routing. Applications of numerical methods in hydraulic engineering. 4 lectures.

CE 434. Groundwater Hydraulics and Hydrology. 4 units

Term Typically Offered: F, SP

Prerequisite: CE 336.

Differential equations of groundwater flow, Darcy's Law, solutions of the steady and unsteady flow, differential equations for confined and unconfined flows. Pumping test design. Groundwater models, leaky aquifers. Saltwater intrusion. 4 lectures.

CE 435. Engineering Hydrology. 4 units

Term Typically Offered: F

Prerequisite: CE 336.

Analysis of hydrologic cycle components such as precipitation, infiltration and evaporation. Rainfall-runoff analysis to determine peak flows and runoff hydrographs. Hydrologic river and reservoir routings and their applications for flood plain management. Application of frequency analysis methods to determine design rainfalls and design flows. 4 lectures.

CE 440. Hydraulic Systems Engineering. 4 units

Term Typically Offered: F, W

Prerequisite: CE 336.

Water and wastewater flows. Design of water distribution systems, transmission and storage reservoirs, wastewater collection systems, and storm water systems. Pumps and pump systems, flow measurements. Water sources for municipal supply. 3 lectures, 1 laboratory.

CE 454. Structural Design. 4 units

Term Typically Offered: W

Prerequisite: CE 355 and CE 356.

Design of reinforced concrete, steel and timber structures. Loading standards, code design methods, connection design. Comprehensive design projects. 2 lectures, 2 laboratories.

CE 455. Design of Timber Structures. 4 units

Term Typically Offered: F

Prerequisite: CE 355 or CE 356.

Analysis and design of timber structures with emphasis on construction methodology, and material behavior. Topics include: physical and mechanical properties of structural lumber and glued laminated timber; lateral load paths; diaphragms; connections; shear wall design; and combined load design. 3 lectures, 1 laboratory.

CE 456. Seismic Principles for Civil and Environmental Engineering. 4 units

Term Typically Offered: TBD

Prerequisite: CE 207.

Basic principles in seismic analysis and design of civil and environmental systems. Seismological aspects of earthquakes. Simple concepts in structural dynamics. Simplified code-based analysis and design. 4 lectures. Not open to students with credit in CE 557.

CE 457. Bridge Engineering. 4 units

Term Typically Offered: SP

Prerequisite: CE 355.

Fundamentals of the structural analysis and design of highway bridges. Construction materials in bridges. Loads on highway bridges. Load path and distribution in bridge superstructure. Design of reinforced concrete, pre-stressed concrete, and composite bridges. 3 lectures, 1 laboratory.

CE 458. Fiber Reinforced Polymer (FRP) Design. 4 units

Term Typically Offered: TBD

Prerequisite: CE 355. Concurrent: CE 356.

Properties and mechanical characteristics of Fiber Reinforced Polymer (FRP) composite materials; applications in civil engineering structures as primary or secondary reinforcement; and design techniques based on newly developed ACI 440 design guidelines and worldwide experience in FRP design. Not open to students with credit in CE 558. 3 lectures, 1 laboratory.

CE 459. FRP Strengthening of Reinforced Concrete Structures. 4 units

Term Typically Offered: TBD

Prerequisite: CE 355.

Flexural and shear strengthening reinforced and prestressed concrete members using fiber reinforced polymer composite plates and laminates; seismic repair and rehabilitation of columns, slabs, beams and structures. Focus on design philosophy and design methodology, based on the current understanding of FRP-strengthening techniques. Not open to students with credit in CE 556. 3 lectures, 1 laboratory.

CE 465. Civil Engineering Professional Practice. 1 unit

Term Typically Offered: F

Prerequisite: Senior standing and consent of instructor.

Advising for Senior Design Project and examination of the non-technical and professional issues engineering design professionals regularly encounter. Topics include: communications styles and assertiveness, technical communications (oral and written), lifelong learning, contemporary civil engineering issues, leadership, ethics, and personal and project management. 1 activity.

CE 466. Senior Design Project I. 3 units

Term Typically Offered: W

Prerequisite: CE 321, CE 322, CE 336, CE 337, CE 355, CE 381, CE 382, CE 465, and consent of instructor.

Work on multi-disciplinary teams to complete an integrated civil design project. Focus on formal instruction, through project based learning, on selected topics in geotechnical, structural, transportation, and water resources engineering design. Non-technical topics include team building, technical communications, and professional practice skills that must be mastered to become a successful design professional. 2 lectures, 1 laboratory.

CE 467. Senior Design Project II. 3 units

Term Typically Offered: SP

Prerequisite: CE 466.

Continuation of work on multi-disciplinary teams to complete an integrated civil design project started in CE 466. Focus of formal instruction on selected topics in geotechnical, structural, transportation, and water resources engineering design culminating with oral and written presentations of Senior Design projects. 2 lectures, 1 laboratory.

CE 468. Community Engineering Senior Design Project I. 3 units

Term Typically Offered: TBD

Prerequisite: CE 321, CE 322, CE 336, CE 337, CE 355, CE 381, CE 382 and CE 465.

Two-part series. Student teams work in cooperation with a local community organization to complete an integrated civil design project. Projects representative of those encountered in professional practice. Focus on professional as well as design issues. Volunteer service required. 2 lectures, 1 laboratory.

CE 469. Community Engineering Senior Design Project II. 3 units

Term Typically Offered: TBD

Prerequisite: CE 468.

Two-part series. Student teams work in cooperation with a local community organization to complete an integrated civil design project. Projects representative of those encountered in professional practice. Focus on professional as well as design issues. Volunteer service required. 2 lectures, 1 laboratory.

CE 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

CE 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

CE 474. Environmental Compliance and Permitting. 2 units

Term Typically Offered: F

Prerequisite: Senior standing.

Fundamentals of State and Federal environmental laws essential to getting Civil Engineering projects permitted. 2 lectures.

CE 475. Civil Infrastructure and Building Systems. 4 units

Term Typically Offered: F, W

Prerequisite: Senior standing in CE or ARCE.

Principles and practices for the sustainable design, fabrication, and installation of systems for the civil infrastructure and building; including structural, air/gas, water/wastewater, electrical, and control systems. Methods and materials used for fabrication and installation; including cost and schedule considerations. 4 lectures. Crosslisted as ARCE/CE 475.

CE 481. Analysis and Design of Shallow Foundations. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CE 381 and CE 382.

Evaluation of shear strength for foundation design. Analysis of bearing capacity for generalized conditions. Design of reinforced concrete spread footings. Stress distributions beneath loaded areas. Immediate settlement, consolidation settlement, rate of consolidation, and creep. 4 lectures.

CE 486. Introduction to Geological Engineering. 4 units

Term Typically Offered: TBD

Prerequisite: CE 381, CE 382, and GEOL 201.

Identification and characterization of consolidated geologic materials for the purpose of civil analysis and design. Interpretation of geologic maps, cross sections, and reports. Interpretation of aerial photographs. Engineering considerations important in dealing with transported soils. 4 lectures.

CE 487. Design of Foundations and Slopes in Rock. 4 units

Term Typically Offered: TBD

Prerequisite: CE 381, CE 382, and GEOL 201.

Evaluation of the engineering properties of rocks. Rock core description. Slope stability analyses in rock. Discontinuity analysis. Rockfall hazard assessment and mitigation. Design of shallow foundations on rock. 4 lectures.

CE 488. Engineering Risk Analysis. 4 units

Term Typically Offered: F

Prerequisite: CE 381 and STAT 312.

Introduction to the basic concepts of probability theory, statistics, and decision theory as they pertain to problems in civil and environmental engineering. Emphasis placed on the use of probabilistic modeling, Bayesian statistics, risk analysis, and decision theory. 4 lectures.

CE 493. Cooperative Education Experience. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units.

CE 494. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units.

CE 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

CE 500. Individual Study. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair, graduate advisor and supervising faculty member.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Total credit limited to 4 units.

CE 501. Advanced Matrix Analysis of Structures I. 4 units

Term Typically Offered: F

Prerequisite: CE 406.

Matrix terminology and operations. Matrix procedures for analysis of two-dimensional frameworks. Development of stiffness, flexibility and mixed methods. Development of algorithms and programs for use in the analysis of structural frameworks. Discussion of modeling issues and limitations. 3 lectures, 1 laboratory.

CE 504. Finite Element Analysis. 4 units

Term Typically Offered: SP

Prerequisite: CE/ME 404 and CE 511 or ME 501 or consent of instructor.

Linear finite element theory and analysis. Strong, weak and variational formulations. Physical and isoparametric spaces. Error estimates and numerical integration. Development of finite element algorithms. Use of commercial finite element codes to illustrate course concepts including modeling issues and limitations. 3 lectures, 1 laboratory. Crosslisted as CE/ME 504.

CE 511. Continuum Mechanics and Elasticity. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Introduction to continuum mechanics. Kinematics, stress, and balance laws. Constitutive theory for isotropic and anisotropic solids and viscous fluids. Applications including design of beams and pressure vessels, stress concentrations, fiber-reinforced composites, and non-homogeneous biological materials. 4 lectures. Crosslisted as CE 511/ME 501.

CE 513. Inelastic Stress Analysis. 4 units

Term Typically Offered: TBD

Prerequisite: ME 501 or CE 511.

Perfectly plastic and work hardening materials; von Mises and Tresca yield, isotropic and kinematic hardening flow rules, boundary-value problems. Finite elasticity: kinematics, Cauchy- and Green-elasticity, invariance, constraints, Neo-Hookean and Mooney-Rivlin materials, experimental approaches, non-uniqueness, anisotropy, residual stress, thermoelasticity, boundary-value problems. 4 lectures. Crosslisted as CE 513/ME 503.

CE 521. Highway Pavement Designs. 4 units

Term Typically Offered: SP

Prerequisite: CE 321, CE 259, CE 381 or graduate standing.

Theories, principles, and procedures in the structural design of highway pavements. Design of flexible and rigid pavements. Performance of flexible and rigid pavements in the field and the characterization of pavement materials. Practical and direct exposure to laboratory testing of pavement materials. 3 lectures, 1 laboratory.

CE 523. Transportation Systems Planning. 4 units

Term Typically Offered: F

Prerequisite: CE 321 or graduate standing.

Planning of urban and regional multimodal transportation systems. Modeling of transportation networks and travel demand. Travel survey design. Urban data systems. Evaluation of alternatives based on economic, social, technological, and other factors. 2 lectures, 2 laboratories.

CE 524. Pavement Performance and Management Systems. 4 units

Term Typically Offered: TBD

Prerequisite: CE 321, CE 322, CE 259.

Introduction to pavement management; pavement distress data collection; deflection measurements and analysis; pavement performance modeling; pavement structure design; maintenance planning and rehabilitation strategies; prioritization and optimization; computer applications in pavement management. 2 lectures, 2 laboratories.

CE 525. Airport Planning and Design. 4 units

Term Typically Offered: W

Prerequisite: CE 321 or graduate standing.

Historical background of aviation and airport development; financing; estimating demand; aircraft characteristics; airport capacity; airspace and air traffic control; site selection; airport configuration; geometric design of landing area; planning and development of terminal areas; lighting; pavement design and drainage. 3 lectures, 1 laboratory.

CE 526. Transportation Safety. 4 units

Term Typically Offered: W

Prerequisite: CE 321, CE 322, STAT 312.

Introduction to nature and extent of transportation safety problem worldwide and in the United States. Several sub-areas of transportation safety: road safety, human factors, vehicle safety; crash data collection and management; safety planning; hot spot identification; methodologies for conducting transportation accident studies; statistical applications to accident data; predictive model building; 'before-after' studies; countermeasure design. 3 lectures, 1 laboratory.

CE 527. Sustainable Mobility. 4 units

Term Typically Offered: SP

Prerequisite: CE 321 or CRP 435 or consent of instructor.

Presentation and analysis of concepts and designs for sustainable mobility from a global-to-local, interdisciplinary perspective, including pedestrians, bicyclists, and public transportation. Addresses economy, environment, and equity (social issues) through lectures, panels, excursions and a planning/design project in San Luis Obispo County. 3 lectures, 1 laboratory.

CE 528. Transportation Economics and Analysis. 4 units

Term Typically Offered: TBD

Prerequisite: CE 321 or graduate standing.

Principles of engineering systems analysis and applications to transportation using examples from different modes. Identification of transportation benefits, costs, user and non-user impacts, transportation cost models, pricing, and optimization. 3 lectures, 1 laboratory.

CE 529. Modeling and Simulation in Transportation. 4 units

Term Typically Offered: SP

Prerequisite: CE 321 or graduate standing.

Theory and operation of transportation systems, the systems approach, simulation techniques. Use of available software packages. Simulation model development, calibration and use. 2 lectures, 2 laboratories.

CE 533. Advanced Water Resources Engineering. 4 units

Term Typically Offered: SP

Prerequisite: CE 336 or graduate standing.

Matrix and simulation methods in hydrology, statistical studies in hydrology and their applications to civil engineering problems. Generalized hydrologic characteristics. Hydrologic simulation, computer applications, urban and small watershed hydrology, macroscopic and microscopic approach. Storm water management models. Hydrologic design. 4 lectures.

CE 535. Water Resources Systems Planning and Analysis. 4 units

Term Typically Offered: TBD

Prerequisite: CE 336 or graduate standing.

Water resources planning, development, system analysis and optimization. Dynamic programming, multi-objective water resource systems. 4 lectures.

CE 536. Computer Applications in Water Resources with Geographic Info Systems (GIS). 4 units

Term Typically Offered: W

Prerequisite: CE 336 or graduate standing.

Modeling, design and analysis of water, wastewater, stormwater systems. Integration of water resource systems with Geographic Information Systems (GIS). 3 lectures, 1 laboratory.

CE 537. Groundwater Contamination. 4 units

Term Typically Offered: W

Prerequisite: CE 434. Corequisite: ENVE 331.

Sources and types of groundwater contamination, contamination transport mechanisms. Sorption and other chemical reactions. Numerical modeling of contaminant transport. Nonaqueous phase liquids. Groundwater remediation and design. 4 lectures.

CE 538. Urban Water Systems. 4 units

Term Typically Offered: SP

Prerequisite: CE 440 or graduate standing.

Integration of water delivery, wastewater collection, drainage systems, and associated treatment components in urbanizing areas. Relationships between surface and groundwater elements of water sources and disposal. Use of current design models to quantify the benefits of non-traditional options. 4 lectures.

CE 539. Environmental Hydraulics. 4 units

Term Typically Offered: W

Prerequisite: CE 336 or graduate standing.

Application of fluid mechanics principles to environmental flows. Emphasis on advection, dispersion, stratification and mixing effects. Stratified flows, turbulent jets and plumes, wastewater and thermal diffusers, cooling ponds and channels, control of environmental problems. 4 lectures.

CE 552. Analysis and Seismic Design of Reinforced Concrete. 4 units

Term Typically Offered: SP

Prerequisite: CE 454. Recommended: Concurrent enrollment in CE 557.

Emphasis placed on reinforced concrete behavior and seismic design. Topics include moment curvature analysis and plastic hinge modeling, strut and tie, design of structural walls, design of concrete moment frames and seismic detailing. 4 lectures.

CE 553. Ductile Design of Steel Structures. 4 units

Term Typically Offered: W

Prerequisite: CE 356 and senior or graduate standing. Recommended: CE 454 and CE 407.

Plastic analysis and capacity design principle; design of ductile steel structures including moment frames, concentrically braced frames, eccentrically braced frames, buckling-restrained braced frames, and steel plate shear walls according to the AISC Seismic Provisions for Structural Steel Buildings. 3 lectures, 1 activity.

CE 555. Advanced Civil Engineering Materials Laboratory. 2 units

Term Typically Offered: TBD

Prerequisite: CE 259 or graduate standing.

Fundamental properties of new and advanced materials. Experimental techniques. Fracture characteristics and composite response of cement matrix composites. New materials and products to advanced applications such as automation. 2 laboratories.

CE 556. Advanced Fiber Reinforced Polymer (FRP) Strengthening of Reinforced Concrete Structures. 4 units

Term Typically Offered: TBD

Prerequisite: CE 355.

Flexural and shear strengthening reinforced and pre-stressed concrete members using FRP composite laminates and plates; seismic repair and rehabilitation of columns, beams, slabs and whole structures. Design philosophies based on the current ACI 440 and the most up to date research in FRP composites. Durability, fire protection and blast mitigation of structures utilizing FRP laminates. Not open to students with credit in CE 459. 3 lectures, 1 laboratory.

CE 557. Seismic Analysis and Design for Civil Engineers. 4 units

Term Typically Offered: SP

Prerequisite: CE 407.

Extension of the basic principles of structural dynamics to analysis of civil structures (buildings, bridges, tanks, etc.) to earthquake loading. Code based (Uniform Building Code and AASHTO) earthquake resistant design of civil structures. Not open to students with credit in CE 456. 3 lectures, 1 laboratory.

CE 558. Advanced Fiber Reinforced Polymer (FRP) Design. 4 units

Term Typically Offered: TBD

Prerequisite: CE 355.

Properties and mechanical characteristics of FRP composites and design methodologies based on the current understanding and usage of FRP composites. Applications of composite rebars in civil engineering structures as primary reinforcement. Design and analysis of reinforced concrete structures utilizing FRP rebars based on the ACI 440 design guidelines. Not open to students with credit in CE 458. 3 lectures, 1 laboratory.

CE 559. Prestressed Concrete Design. 4 units

Term Typically Offered: W

Prerequisite: CE 355 or graduate standing.

Advanced analysis, design and behavior of prestressed and precast concrete elements and structures. Origin of code requirements. Detailed design of prestressed concrete components of civil engineering systems for buildings and highway construction. Creep and shrinkage of concrete and relaxation of steel applied to prestressing losses. 4 lectures.

CE 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 seminars.

CE 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

CE 581. Advanced Geotechnical Engineering. 4 units

Term Typically Offered: SP

Prerequisite: CE 481 or graduate standing.

Advanced topics in saturated flow, unsaturated flow, and consolidation. Stress-strain-deformation response of soils under both drained and undrained loading. Conventional and advanced laboratory strength testing. 3 lectures, 1 laboratory.

CE 583. Geotechnical Earthquake Engineering. 4 units

Term Typically Offered: W

Prerequisite: CE 481 and CE 407 or graduate standing.

Introduction to engineering seismology and ground motion evaluation. Dynamic behavior of soils. Seismic site response analysis. Soil liquefaction evaluation methods and mitigation techniques. Seismic stability of slopes and retaining walls. Computer-aided analysis. 4 lectures.

CE 584. Lateral Support Systems. 4 units

Term Typically Offered: TBD

Prerequisite: CE 481 or graduate standing.

Classical and modern earth pressure theories. Lateral earth pressure calculations for general subsurface conditions. Analysis and design of reinforced concrete cantilever walls, sheetpile walls, soldier-pile walls, tie-back walls, and mechanically-stabilized earth. Computer-aided analysis and design. 4 lectures.

CE 585. Slope Stability Analysis. 4 units

Term Typically Offered: SP

Prerequisite: CE 481 or graduate standing.

Analysis of stability by planar, circular arc, piecewise-linear, and composite-surface techniques. Analysis of earth-fill dams and reservoirs for static, steady flow, sudden drawdown, and seismic loading conditions. Field instrumentation. Methods for slope remediation and stabilization. Computer-aided analysis. 4 lectures.

CE 586. Analysis and Design of Deep Foundations. 4 units

Term Typically Offered: W

Prerequisite: CE 481 or graduate standing.

Bearing capacity and settlement analysis of drilled shafts and driven piles. Analysis and design of single piles and pile groups for vertical, lateral, and combined loading. Construction procedures, field inspection, and load-testing. Computer-aided analysis and design. 4 lectures.

CE 587. Geoenvironmental Engineering. 4 units

Term Typically Offered: SP

Prerequisite: CE 381.

Principles for containment applications. Engineering properties of soils and geosynthetics and their interaction with contaminants and wastes; analysis of geosynthetics used in containment facilities; liners; covers; leachate and gas collection systems; contaminant transport; and monitoring systems. 4 lectures.

CE 588. Ground Improvement. 4 units

Term Typically Offered: TBD

Prerequisite: CE 381, CE 382, and CE 481.

Ground improvement applications investigated for modification of geomechanical and hydraulic properties of soils. Engineering properties of soft ground and high water content materials; mechanical, chemical, and thermal stabilization investigated for foundation and environmental remediation applications. 4 lectures.

CE 589. Geosynthetics Engineering. 4 units

Term Typically Offered: F

Prerequisite: CE 481.

Geosynthetics applications within civil engineering. Design content for geotechnical, geoenvironmental, and transportation applications. Manufacturing processes, material properties, interaction with soils, and service conditions. 4 lectures.

CE 591. Graduate Seminar I. 1 unit

Term Typically Offered: F

Prerequisite: Graduate standing.

Preparation for graduate studies and engineering careers. Further development of oral and written communication skills. 1 seminar.

CE 592. Graduate Seminar II. 1 unit

Term Typically Offered: W

Prerequisite: CE 591 and graduate standing.

Current research activities and analysis/design philosophies in civil and environmental engineering practice. Development of oral and written presentation skills. 1 seminar.

CE 593. Cooperative Education Experience. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only.

CE 594. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only.

CE 595. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only.

CE 596. Comprehensive Examination. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing. Recommended: Student should be in the final quarter of completing graduate coursework (45 units of 400 and 500 level coursework) and prepared to take the MS exam.

Comprehensive exam for a non-thesis master's student. The comprehensive examination assesses the student's ability to integrate knowledge, show critical and independent thinking, and demonstrate mastery of the subject matter. Timing of the comprehensive exam shall be scheduled with the faculty advisor per department guidelines.

CE 599. Design Project (Thesis). 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing.

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis.

Communication Studies (COMS)

COMS Courses

COMS 101. Public Speaking. 4 units

GE Area A2

Term Typically Offered: F,W,SP,SU

Introduction to the principles of public speaking. Practical experience in the development, presentation, and critical analysis of speeches to inform, to persuade, and to actuate. Not open to students with credit in COMS 102. 4 lectures. Crosslisted as COMS/HNRS 101. Fulfills GE A2; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A2.

COMS 102. Principles of Oral Communication. 4 units

GE Area A2

Term Typically Offered: F, W, SP

Introduction to the fundamentals and principles which underlie effective oral communication. Practical experience in various types of speaking situations: informative speaking, persuasive speaking, and panel discussion. Not open to students with credit in COMS 101. 4 lectures. Crosslisted as COMS/HNRS 102. Fulfills GE A2; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A2.

COMS 126. Argument and Advocacy. 4 units

GE Area A3

Term Typically Offered: W, SP

Prerequisite: Completion of GE Area A1 with a grade of C- or better. Recommended: Completion of GE Area A2.

The nature of critical thinking as applied in written and oral argument. Analysis of inductive and deductive reasoning. Analysis of reasoning, argument, forms of support and fallacies of argument and language. Instruction in and practical experience in writing sound persuasive arguments and engaging in oral argumentation assignments. 4 lectures. Fulfills GE A3; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A3.

COMS 145. Reasoning, Argumentation, and Writing. 4 units

GE Area A3

Term Typically Offered: W, SP

Prerequisite: Completion of GE Area A1 with a grade of C- or better.

Recommended: Completion of GE Area A2.

The principles of reasoning in argumentation. Examination of rhetorical principles and responsible rhetorical behavior. Application of these principles to written and oral communications. Effective use of research methods and sources. 4 lectures. Crosslisted as COMS/ENGL/HNRS 145. Fulfills GE A3; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A3.

COMS 201. Advanced Public Speaking. 4 units

Term Typically Offered: F

Prerequisite: Completion of GE Area A2 with a grade of C- or better.

Further consideration of the principles of public address. Advanced practice in manuscript, extemporaneous, and impromptu speaking. 4 lectures.

COMS 208. Performance of Literature. 4 units

GE Area C3

Term Typically Offered: F, SP

Prerequisite: Completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Poetry, prose, nonfiction and dramatic literature performed to communicate the levels of meaning within each work to the audience. 4 lectures. Fulfills GE C3.

COMS 212. Interpersonal Communication. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A2 with a grade of C- or better.

Introduction to the interaction process in two-person (dyadic) communication settings. Emphasis on the functions of varying messages in the initiation, development, maintenance and termination of personal and professional relationships. 4 lectures. Crosslisted as COMS/PSY 212.

COMS 213. Organizational Communication. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A2 with a grade of C- or better.

Introduction to communication within the organization and between the organization and its environment. Effects of networks, superior/subordinate message patterns, team building, climate, message flow patterns and distortion on organizational effectiveness. 4 lectures.

COMS 217. Small Group Communication. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A2 with a grade of C- or better.

Basic principles and techniques of small group communication. Survey of the importance of discussion in contemporary society, including study of and practice in informal group discussion, panel discussion, symposium, and forum. 4 lectures.

COMS 218. Media, Self and Society. 4 units

GE Area D4

Term Typically Offered: W, SP

Overview of the interaction between mass media and individuals in American society. Drawing on theoretical perspectives from mass communication and psychology to explore how individuals develop a coherent understanding of self within a highly mediated world. The power and influence of media messages and practices. Individual responsibility in an information society. 4 lectures. Crosslisted as COMS/JOUR 218. Fulfills GE D4.

COMS 226. Applied Argumentation. 4 units

Term Typically Offered: SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

Intermediate level course in the theory and practice of everyday argument. Select theories of argumentation, and practical experience arguing in a wide variety of contexts. 4 lectures.

COMS 250. Forensic Activity. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A2 with a grade of C- or better.

Introduction to competitive debate activities. Research, analysis, and debating about contemporary issues. Any student who wishes to receive academic credit for participation in such activities during the quarter should enroll. Total credit limited to 6 units. 2 laboratories.

COMS 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

COMS 301. Business and Professional Communication. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A2 with a grade of C- or better.

Communication skills and functions for all levels of organizational employees. Interviewing, oral briefings, motivational and conference speaking. 4 lectures.

COMS 308. Group Performance of Literature. 4 units

GE Area C4

Term Typically Offered: W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C3.

Examination and experience in the various modes of group performance of literature: Readers Theatre, Chamber Theatre, Story Theatre. Scripting; directing; performing and critiquing of group performance of literature. 4 lectures. Fulfills GE C4 except for Communication Studies majors.

COMS 311. Communication Theory. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

Survey of human communication theories including interpersonal, small group, organizational, persuasion, nonverbal, intercultural, and media. Philosophical foundations for understanding communication from a social science perspective. 4 lectures.

COMS 312. Communication Research Methods. 4 units

Term Typically Offered: F, W, SP

Prerequisite: COMS 311 and STAT 217, junior standing; for COMS majors only.

Exploration of communication research strategies and methodologies. Basic methods of designing research in empirical communication studies. 4 lectures.

COMS 315. Intergroup Communication. 4 units

Term Typically Offered: F

Prerequisite: Completion of GE Area A with a grade of C- or better.

Survey of theory and research concerning language and communication between various social groups (e.g., age, sex, race, sexual orientation), with an emphasis on understanding the role verbal, nonverbal, and mass communication plays in identity formation and differentiating group members. 4 lectures.

COMS 316. Intercultural Communication. 4 units

GE Area D5; USCP

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; completion of one lower division Area D course.

Cultural aspects of communication within and among diverse groups. Particular focus on U.S. culture and history and the diversity of ethnic, subcultural, and co-cultural groups. Development of nuanced understanding of the role of culture and communication in human thought, behavior, and interaction. Course may be offered in classroom-based or online format. 4 lectures. Not open to students with credit in COMS 416. Fulfills USCP. Fulfills GE D5 except for Communication Studies majors.

COMS 317. Technology and Human Communication. 4 units

Term Typically Offered: SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

Impact of technological change upon human communication. Past, present, and future technological developments that have affected how humans communicate. Emphasis on new communication technologies. 4 lectures.

COMS 319. Critical Cultural Studies and Communication. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing and completion of GE Area A with a grade of C- or better.

Analysis and integration of theories and methods of Cultural Studies as an interdisciplinary mode of critical qualitative inquiry. Emphasis on the role of communication in differential power relations, particularly on issues of identity, struggle, and representation in a diverse culture. 4 lectures.

COMS 322. Persuasion. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of A- or better.

Theory of persuasion with particular emphasis upon social psychological principles of influence. Analysis of various forms of persuasion, social influence and propaganda. 4 lectures.

COMS 330. Classical Rhetorical Theory. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of A- or better.

Early development of rhetorical theory in Greco-Roman civilization. Analysis of the canons of rhetoric. Rhetorical thought of Sophists, Isocrates, Plato, Aristotle, Cicero and Quintilian. 4 lectures.

COMS 331. Contemporary Rhetorical Theory. 4 units

Term Typically Offered: F

Prerequisite: Junior standing and completion of GE Area A with a grade of C- or better.

Rhetoric's role in contemporary culture. Issues: political advocacy; science, technology and mass persuasion; ethics and rhetoric. Representative theorists: Burke, Weaver, Richards, Toulmin and McLuhan. 4 lectures.

COMS 332. Rhetorical Criticism. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing, COMS 330.

Theory and method used in the analysis and evaluation of rhetorical discourse. Study of critical essays. Practice in interpreting and evaluating persuasive discourse. 4 lectures.

COMS 350. Advanced Forensic Activity. 2 units

Term Typically Offered: F, W, SP

Prerequisite: COMS 250.

Advanced participation in intercollegiate speech activities. Intercollegiate tournament competition, judging speech competition and other communication-related public service on campus and in the community. Total credit limited to 6 units. 2 laboratories.

COMS 385. Media Criticism. 4 units

Term Typically Offered: F, W

Prerequisite: Junior standing and completion of GE Area A with a grade of C- or better.

Theory and method used in analyzing media from critical, rhetorical, and cultural perspectives. Practice in interpreting and evaluating news, advertising, prime-time television, the Internet, and other mass-mediated texts, with special attention to relationships among media, identity, and political action. 4 lectures.

COMS 386. Communication, Media, and Politics. 4 units

GE Area D5

Term Typically Offered: F, SU

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; completion of one lower division Area D course. Recommended: COMS 218 or POLS 112.

Political communication and the U.S. mass media system, including role of the media in democratic society; news norms, government regulation of media, and media ownership; the changing media landscape and implications for news construction, polarization, and selective exposure; and incivility and bias. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE D5 except for Communication Studies majors.

COMS 390. Environmental Communication. 4 units

Term Typically Offered: W

Prerequisite: Junior standing and completion of GE Area A with a grade of C- or better. Recommended: Completion of GE Area B2 or B3.

Recent developments in the field of environmental communication, including how and with what effect environmental messages are transmitted among scientists, policymakers, and the public. Critical/rhetorical and mediated perspectives that inform contemporary understandings of the human-nature relationship are addressed. 4 lectures.

COMS 395. Science Communication. 4 units

Term Typically Offered: F

Prerequisite: Completion of GE area A with a grade of C- or better and completion of one GE area B course.

Examination of science communication in a variety of contexts. Issues covered may include: scientific journal articles, boundary-work, information deficit models, public understanding/awareness of science, accommodated science, mediated science, popular science. 4 lectures.

COMS 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor and junior standing.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units.

COMS 413. Advanced Organizational Communication. 4 units

Term Typically Offered: W

Prerequisite: COMS 213 or COMS 301; junior standing.

Describing and measuring the organization's human message system. Planning and implementing communication training and development for the organization. New functions, careers and opportunities for the communication professional. 4 lectures.

COMS 418. Health Communication. 4 units

Term Typically Offered: F

Prerequisite: Junior standing and completion of GE Area A with a grade of C- or better.

Communication in health contexts. Topics include interpersonal communication (e.g., health professional/patient), group and organizational communication (e.g., health-related groups), and mass communication (e.g., persuasive health campaigns). Open to all majors and valuable to laypersons who are consumers of health care, and pre-health professionals. 4 lectures.

COMS 419. Media Effects. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and completion of GE Area A with a grade of C- or better.

Effects of media on the individual. Influence of mediated message producers, production technologies, and message content. Empirical approaches to data collection using experimental and survey techniques. 4 lectures.

COMS 420. Nonverbal Communication. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A with a grade of C- or better.

Influence of kinesic, proxemic, artifactual, olfactory, paralinguistic and environmental factors in human communication. Theory, research and practice in nonverbal communication. 4 lectures.

COMS 421. Gender and Communication. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing and completion of GE Area A with a grade of C- or better.

Explores the theory and practice of how gender is created, maintained, and transformed through communication; examines how gender roles are enacted and interpreted in various public and private contexts. 4 lectures.

COMS 422. Rhetorics of Science, Technology, and Medicine. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing and completion of GE Area A with a grade of C- or better.

Examination of rhetorical strategies and persuasive techniques used within scientific, technical, and medical discourses. Topics include genre features of scientific articles, rhetorical topoi in scientific discourse, pop-culture depictions of science, the scientific ethos, and risk communication. 4 lectures.

COMS 428. Family Communication. 4 units

Term Typically Offered: F

Prerequisite: Completion of GE Area A with a grade of C- or better; and COMS/PSY 212.

Communication theory and practice within family structures. Examination of relationship communication in marital/partnership, parent/child, intergenerational, and sibling relationships. Topics include family communication regarding identity, attachment, conflict, relational dialectics, storytelling/narratives, family transitions, cultural influences, and family support. 4 lectures.

COMS 435. American Political Rhetoric. 4 units

Term Typically Offered: F, W

Prerequisite: Junior standing.

Role of oratory in American political and social history since Lincoln. Historical and rhetorical analyses of important political speeches delivered by presidents, activists, demagogues, and leaders of social movements. 4 lectures.

COMS 450. Internship: Communication Studies. 2-4 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing, 2.5 GPA, and consent of instructor.

Supervised practicum and application of principles and theories of communication in organizational settings. Total credit limited to 8 units. Credit/No Credit grading only.

COMS 458. Solving Big World Challenges. 4 units

Term Typically Offered: F, W

Prerequisite: Completion of GE Area A with a grade of C- or better.

Apply human-centered design practices to address a social or an environmental challenge, specific to a local community. Achieve revenue-generating social impact through innovative business models. Practice team competencies including problem-solving, interviewing, brainstorming, prototyping, and written, visual, and oral communication. 4 lectures. Crosslisted as BUS/COMS 458.

COMS 460. Undergraduate Seminar. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Completion of COMS 311, COMS 312, COMS 330 and COMS 332, and junior standing; for COMS majors only.

Discussion and design of individual projects, oral reports on material in current professional writings. 1 seminar.

COMS 461. Senior Project. 3 units

Term Typically Offered: F, W, SP

Prerequisite: COMS 460; for COMS majors only.

Completion of approved project under faculty supervision. Project results are presented in a formal written report. Minimum 90 hours total time.

COMS 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area A with a grade of C- or better.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

COMS 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: 2.5 GPA and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only.

Computer Engineering (CPE)

CPE Courses

CPE 100. Computer Engineering Orientation. 1 unit

CR/NC

Term Typically Offered: F

Introduction to the computer engineering discipline. Success skills and curricular information. Career paths and opportunities. Professional aspects of engineering and computer science. Interaction with upper division students, alumni, faculty and staff. Introduction to computer software and hardware. Credit/No Credit grading only. 1 lecture.

CPE 101. Fundamentals of Computer Science. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 117 with a grade of C- or better; or MATH 118 with a grade of C- or better; or consent of instructor.

Basic principles of algorithmic problem solving and programming using methods of top-down design, stepwise refinement and procedural abstraction. Basic control structures, data types, and input/output. Introduction to the software development process: design, implementation, testing and documentation. The syntax and semantics of a modern programming language. Credit not available for students who have taken CSC/CPE 108. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 101.

CPE 105. Fundamentals of Computer Science I Supplemental Instruction. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: CPE/CSC 101.

Facilitated study and discussion of fundamental concepts of computer science and familiarization with programming environments. Credit/No Credit grading only. 1 laboratory. Crosslisted as CPE/CSC 105.

CPE 108. Accelerated Introduction to Computer Science. 4 units

Term Typically Offered: TBD

Prerequisite: MATH 118 (or equivalent) with a grade of C- or better, significant experience in computer programming, and consent of instructor.

Accelerated introduction to basic principles of algorithmic and object-oriented problem solving and programming. Introduction to programming language concepts including control structures, data types, classes, and inheritance. Program design principles. Use and implementation of algorithms (searching, sorting, recursion) and data structures (lists, stacks, and queues). Intended for students with experience in algorithmic problem solving and using basic control structures and data types in a modern programming language (CPE/CSC 101), but who are not ready for CPE/CSC 202. Not open to students with credit in CPE/CSC 102 or CPE/CSC 202. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 108.

CPE 123. Introduction to Computing. 4 units

Term Typically Offered: F

Prerequisite: Basic computer literacy.

Use of a supportive software development environment to design, develop, and test applications in a selected topic domain that demonstrates the potential of careers in computing. An introduction to computing and to the selected topic domain. The Schedule of Classes will list topic selected. No programming experience required. Not for students with credit in CPE/CSC 103 or CPE/CSC 203. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 123.

CPE 133. Digital Design. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: An orientation course in student's major (EE 111 & EE 151 for EE students, CPE 100 for CPE students), CPE/CSC 101.

Number systems, Boolean algebra, Boolean functions, and function minimization. Analysis and design of combinational and sequential logic circuits. Hardware Description Language (HDL) concepts and applications digital design and synthesis in Programmable Logic Devices (PLDs). Not open to students with credit in CPE/EE 129. Course may be offered in classroom-based or online format. 3 lectures, 1 laboratory. Crosslisted as CPE/EE 133.

CPE 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

CPE 202. Data Structures. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CPE/CSC 101 with a grade of C- or better; MATH 141 or MATH 221 with a grade of C- or better; or consent of instructor.

Introduction to data structures and analysis of algorithms. Abstract datatypes. Specification and implementation of advanced data structures. Theoretical and empirical analysis of recursive and iterative algorithms. Software performance evaluation and testing techniques. Not open to students with credit in CSC/CPE 108. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 202. Formerly CPE/CSC 103.

CPE 203. Project-Based Object-Oriented Programming and Design. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CPE/CSC 202 with a grade of C- or better or consent of instructor.

Object-oriented programming and design with applications to project construction. Introduction to class design, interfaces, inheritance, generics, exceptions, streams, and testing. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 203. Formerly CPE/CSC 102.

CPE 233. Computer Design and Assembly Language Programming. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CPE/EE 133.

Design and implementation of digital computer circuits via CAD tools for programmable logic devices (PLDs). Basic computer design with its datapath components and control unit. Introduction to assembly language programming of an off-the-shelf RISC-based microcontroller. Not open to students with credit in CPE/EE 229. 3 lectures, 1 laboratory. Crosslisted as CPE/EE 233.

CPE 290. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

CPE 315. Computer Architecture. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC/CPE 102 and CSC/CPE 103, or CSC/CPE 202 and CSC/CPE 203; and one of the following: CSC 225, CPE/EE 229, or CPE/EE 233.

In-depth study of the instruction set architecture and hardware design of a specific CPU. Introduction to pipelines, input/output and multi-processors. Computer abstractions and performance measurement. 3 lectures, 1 laboratory.

CPE 321. Introduction to Computer Security. 4 units

Term Typically Offered: F, W

Prerequisite: CPE/CSC 357.

Survey of topics in computer system and network security, including protection, access control, distributed access control, operating system security, applied cryptography, network security, firewalls, secure coding practices, and case studies from real-world systems. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 321.

CPE 328. Discrete Time Signals and Systems. 3 units

Term Typically Offered: F, W, SP

Prerequisite: BMED 355 or EE 228. Concurrent: CPE/EE 368.

Discrete-time systems and analysis, with emphasis on linear time-invariant (LTI) systems. Sampling theorem. Classification of discrete-time systems. Convolution and its application to LTI systems. The z transform, discrete-time Fourier transform, and discrete Fourier transform. Introduction to digital filters. 3 lectures. Crosslisted as CPE/EE 328.

CPE 329. Programmable Logic and Microprocessor-Based Systems Design. 4 units

Term Typically Offered: F, SP

Prerequisite: EE 307&347, EE 229&269 or CPE/EE 233.

Design, implementation and testing of programmable logic microprocessor-based systems. Hardware/software tradeoffs (such as timing analysis and power considerations), system economics of programmable logic and microprocessor-based system design. Interfacing hardware components (such as ADCs/DACs, sensors, transducers). 3 lectures, 1 laboratory. Not open to students with credit in CPE/EE 336. Crosslisted as CPE/EE 329.

CPE 336. Microprocessor System Design. 4 units

Term Typically Offered: F, SP

Prerequisite: CPE/EE 233.

Introduction to microcontrollers and integrated microprocessor systems. Hardware/software trade-offs, system economics, and functional configurations. Interface design, real-time clocks, interrupts, A/D conversion, serial and parallel communications, watch-dog timers, low power operation, event-based inter-peripheral communication, and assembly and higher-level language programming techniques. Architecture and design of sampled data and low-power systems. Not open to students with credit in CPE/EE 329. 3 lectures, 1 laboratory. Crosslisted as CPE/EE 336.

CPE 350. Capstone I. 4 units

Term Typically Offered: F

Prerequisite: CPE 329, may be concurrent.

Definition and specification of a system to be constructed in CPE 450; requirements elicitation techniques, research and data gathering methods; project planning, time and budget estimating; project team organization. Ethics and professionalism. 3 lectures, 1 laboratory.

CPE 357. Systems Programming. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC/CPE 102 and CSC/CPE 103 with a grade of C- or better or consent of instructor, or CSC/CPE 202 and CSC/CPE 203 with a grade of C- or better or consent of instructor; and CSC 225 or CPE/EE 229 or CPE/EE 233.

C programming language from a system programming perspective. Standard C language including operators, I/O functions, and data types in the context of system functions. Unix commands, shell scripting, file system, editors. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 357.

CPE 368. Signals and Systems Laboratory. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: BMED 355 or EE 228. Concurrent: CPE/EE 328.

Laboratory work pertaining to linear systems, including Fourier analysis, time and frequency responses, and system transfer function. 1 laboratory. Crosslisted as CPE/EE 368.

CPE 400. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units.

CPE 416. Autonomous Mobile Robotics. 4 units

Term Typically Offered: TBD

Prerequisite: CPE/EE 329 or CPE/EE 336 or both CPE 315 and CPE/CSC 357.

Theory and application of concepts relevant to autonomous mobile robots. Sensor and actuator interfacing, programming mobile robots, mobile robot configurations, software architectures and algorithms. 3 lectures, 1 laboratory.

CPE 419. Applied Parallel Computing. 4 units

Term Typically Offered: TBD

Prerequisite: CPE/CSC 357. Corequisite: CSC 141 or CSC 348.

Recommended: CPE 315.

Introduction to applied parallel computing paradigms: software models, resource allocation, performance measurement, and data sharing. Emphasis on massively parallel computation and performance improvement for a real-world application of significant scope. 3 lectures, 1 laboratory.

CPE 422. Network and Web Security. 4 units

Term Typically Offered: SP

Prerequisite: CPE 464.

Introduction to network and web security, including denial of service, botnets, access control, routing attacks, transport layer attacks, tunneling mechanisms, VPNs, IDS, firewalls, penetration testing, key distribution, browser security, social network security, email security, jamming, and wireless security. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 422.

CPE 428. Computer Vision. 4 units

Term Typically Offered: W

Prerequisite: CPE/CSC 357 or EE 328 or ME 305.

Introduction to the concepts of 2D and 3D computer vision: low-level image processing methods such as filtering and edge detection; feature extraction; segmentation and clustering; stereo vision; appearance-based and model-based algorithms. 3 lectures, 1 laboratory. Crosslisted as CPE/EE 428.

CPE 431. Programming Languages II. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC 430.

Language principles and design issues: bindings, conversion, parameter passing, and dynamic semantics. Language implementation: intermediate code representation, memory management, code optimization, and code generation. Functional programming languages. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 431.

CPE 432. Digital Control Systems. 3 units

Term Typically Offered: F

Prerequisite: EE 302 & EE 342. Concurrent: CPE/EE 472. Recommended: Prior background in discrete time systems, for example EE 328, EE 368.

Theory and applications of digital computers in linear control systems. Discrete time methods are used in analysis and design studies. Digital control systems are synthesized. 3 lectures. Crosslisted as CPE/EE 432.

CPE 439. Introduction to Real-Time Operating Systems. 4 units

Term Typically Offered: F

Prerequisite: CPE/EE 329 or CPE/EE 336.

Theory, design and implementation of real-time operating system-based embedded systems. Scheduling algorithms, operating system resources, peripheral device interfacing and embedded system architecture. Resource management issues in a resource-limited (microcontroller-based) environment. 3 lectures, 1 laboratory. Crosslisted as CPE/EE 439.

CPE 441. Computer-Aided Design of VLSI Devices. 4 units

Term Typically Offered: F

Prerequisite: EE 307 and EE 347. Recommended: EE 308 and EE 348, for students interested in analog design.

Design of VLSI circuits using state-of-the-art CAD software. Design issues and algorithms related to design using CAD. Full custom design through automated design and a major multi-week chip design project in lab. 3 lectures, 1 laboratory. Crosslisted as CPE 441/EE 431.

CPE 450. Capstone II. 3 units

Term Typically Offered: W

Prerequisite: CPE 350.

Team-based design, construction and deployment of an embedded system that includes a custom-built computer. Technical management of product development teams. Technical documentation, configuration management, quality assurance, integration and systems testing. Professionalism. 1 lecture, 2 laboratories.

CPE 453. Introduction to Operating Systems. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC/CPE 357, and CSC/CPE 225 or CPE/EE 229 or CPE/EE 233.

Introduction to sequential and multiprogramming operating systems; kernel calls, interrupt service mechanisms, scheduling, files and protection mechanisms, conventional machine attributes that apply to operating system implementation, virtual memory management, and I/O control systems. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 453.

CPE 454. Implementation of Operating Systems. 4 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 453.

Design and implementation of multiprogramming kernels, systems programming methodology, interprocess communications, synchronization, device drivers and network access methods. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 454.

CPE 458. Current Topics in Computer Systems. 4 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 357.

Selected aspects of design, implementation and analysis of networks, advanced operating and distributed systems. Topics may include process management, virtual memory, process communication, context switching, file system designs, persistent objects, process and data migration, load balancing, security and networks. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 458.

CPE 461. Senior Project I. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CPE 350.

Selection and completion of an individual or team project in laboratory environment. Project results are presented in a formal report. 3 laboratories.

CPE 462. Senior Project II. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CPE 450.

Selection and completion of an individual or team project in laboratory environment. Project results are presented in a formal report. 2 laboratories.

CPE 464. Introduction to Computer Networks. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC/CPE 357. Recommended: STAT 312 or STAT 321 or STAT 350.

Computer network architectures; communications protocol standards; services provided by the network; historical and current examples presented. 3 lectures, 1 laboratory.

CPE 465. Advanced Computer Networks. 4 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 453 and CPE 464.

Advanced topics in computer networks; greater detail of protocol standards and services provided by the network; focus on current industry and research topics. 3 lectures, 1 laboratory.

CPE 469. Distributed Systems. 4 units

Term Typically Offered: F

Prerequisite: CSC/CPE 357.

Foundations of distributed systems, distributed hash tables (peer-to-peer systems), failure detectors, synchronization, election, inter-process communication, consensus, replication, key-value stores, and measurements. 3 lectures, 1 laboratory. Crosslisted as CSC/CPE 469.

CPE 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

CPE 471. Introduction to Computer Graphics. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CPE/CSC 357.

Graphics software development and use of application programming interfaces for 3D graphics. The graphics pipeline, modeling, geometric and viewing transforms, lighting and shading, rendering, interaction techniques and graphics hardware. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 471.

CPE 472. Digital Control Systems Laboratory. 1 unit

Term Typically Offered: F

Concurrent: CPE/EE 432.

Design and programming of microprocessor-based digital controls for electro-mechanical plants. Topics include digital control laws, translation of transfer functions into algorithms, assembly language programming, real-time software design, sample rate selection, finite word-length considerations. 1 laboratory. Crosslisted as CPE/EE 472.

CPE 476. Real-Time 3D Computer Graphics Software. 4 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 471.

Basic and advanced algorithms for real-time, interactive, 3D graphics software. Modeling (polygon mesh, height field, scene graph), real-time rendering and shading (visibility processing, LOD, texture and light maps), collision detection (bounding volumes, complexity management), interactive controls, multi-player game technology, game engine architecture. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 476.

CPE 479. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

CPE 482. Advanced Topics in Systems for Computer Engineering. 4 units

Term Typically Offered: TBD

Corequisite: CPE 350.

Selected aspects of design, implementation, verification and analysis of advanced computer systems. Topics may include computer systems, embedded systems, robotics, mechatronics, haptics, human computer interfaces, digital control, digital signal processing, wireless computing, real time operating systems, and networks. Class Schedule will list topic selected. Total credit limited to 8 units, repeatable in same term. 3 lectures, 1 laboratory.

CPE 485. Autonomous Robot Navigation. 4 units

Term Typically Offered: TBD

Prerequisite: CPE/CSC 357.

Overview of existing autonomous mobile robot systems, basic kinematic modeling, control structures, sensing and sensor modeling, localization, and motion planning algorithms. Implementation of autonomous navigation capabilities. 3 lectures, 1 laboratory.

CPE 488. Microelectronics and Electronics Packaging. 4 units

Term Typically Offered: F, W, SP

Prerequisite: EE 112 or EE 201. Recommended: MATE 210.

Materials, processes, and reliability of microelectronics and electronics packaging, surface mount assembly and printed circuit board fabrication. Organic substrates and ceramic substrates. Mechanical design, thermal, and electrical considerations in electronic packaging. Design for manufacturability. Overview of optoelectronics packaging and other emerging technologies in microelectronics and electronic packaging. Project on design and manufacture of an electronic device. 3 lectures, 1 laboratory. Crosslisted as CPE 488/IME 458/MATE 458.

CPE 493. Cooperative Education Experience. 2 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units.

CPE 494. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units.

CPE 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

CPE 515. Computer Architecture. 4 units

Term Typically Offered: TBD

Prerequisite: CPE 315 and graduate standing, or consent of instructor.

Comparative study and design of multiprocessor, dataflow, RISC, high level language and other new computer architectures. VLSI processor design techniques. 3 seminars, 1 laboratory. Crosslisted as CPE/CSC 515.

CPE 521. Computer Systems. 4 units

Term Typically Offered: SP

Prerequisite: CPE/EE 329 or CPE/EE 336, or equivalent, and graduate standing or consent of instructor.

Organization of modern general purpose, high speed digital computer systems. Design of arithmetic units, control units, memories and memory subsystems. Cost, power and speed trade-offs in the design of such systems. 3 seminars, 1 laboratory. Crosslisted as CPE/EE 521.

CPE 522. Advanced Real-Time Operating Systems Design. 4 units

Term Typically Offered: W

Prerequisite: CPE/EE 439.

Define and implement a microcontroller-based Real-Time Operating System (RTOS). Advanced real-time concepts, kernel structure, task and time management, various intertask communication constructs including semaphores, queues and mailboxes. Scheduler design, memory management and shared resource management in a resource-constrained microcontroller environment. 3 seminars, 1 laboratory. Crosslisted as CPE/EE 522.

CPE 523. Digital Systems Design. 4 units

Term Typically Offered: F

Prerequisite: CPE/EE 329 or CPE/EE 336, and graduate standing.

Full-custom design and analysis of digital circuits using full CMOS, pass-transistor and dynamic circuit topologies. Transistor sizing for minimizing power consumption, delay and other design criteria. 3 seminars, 1 laboratory. Crosslisted as CPE/EE 523.

CPE 564. Computer Networks: Research Topics. 4 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 464 and graduate standing, or consent of instructor.

Exploration of advanced topics in emerging computer networking technologies; focus on leading edge computer network research topics. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 564.

CPE 569. Distributed Computing. 4 units

Term Typically Offered: TBD

Prerequisite: CSC 141 or CSC 348; and CPE/CSC 357; or graduate standing and consent of instructor.

Principles and practices in distributed computing: interprocess communications, group communications, client-server model, distributed objects, message queue system, distributed services, mobile agents, object space, Internet protocols. Distributed algorithms: consensus protocols, global state protocols. Fault tolerance: classification of faults, replication. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 569.

Computer Science (CSC)

CSC Courses

CSC 101. Fundamentals of Computer Science. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 117 with a grade of C- or better; or MATH 118 with a grade of C- or better; or consent of instructor.

Basic principles of algorithmic problem solving and programming using methods of top-down design, stepwise refinement and procedural abstraction. Basic control structures, data types, and input/output. Introduction to the software development process: design, implementation, testing and documentation. The syntax and semantics of a modern programming language. Credit not available for students who have taken CSC/CPE 108. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 101.

CSC 105. Fundamentals of Computer Science I Supplemental Instruction. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: CPE/CSC 101.

Facilitated study and discussion of fundamental concepts of computer science and familiarization with programming environments. Credit/No Credit grading only. 1 laboratory. Crosslisted as CPE/CSC 105.

CSC 108. Accelerated Introduction to Computer Science. 4 units

Term Typically Offered: TBD

Prerequisite: MATH 118 (or equivalent) with a grade of C- or better, significant experience in computer programming, and consent of instructor.

Accelerated introduction to basic principles of algorithmic and object-oriented problem solving and programming. Introduction to programming language concepts including control structures, data types, classes, and inheritance. Program design principles. Use and implementation of algorithms (searching, sorting, recursion) and data structures (lists, stacks, and queues). Intended for students with experience in algorithmic problem solving and using basic control structures and data types in a modern programming language (CPE/CSC 101), but who are not ready for CPE/CSC 202. Not open to students with credit in CPE/CSC 102 or CPE/CSC 202. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 108.

CSC 123. Introduction to Computing. 4 units

Term Typically Offered: F

Prerequisite: Basic computer literacy.

Use of a supportive software development environment to design, develop, and test applications in a selected topic domain that demonstrates the potential of careers in computing. An introduction to computing and to the selected topic domain. The Schedule of Classes will list topic selected. No programming experience required. Not for students with credit in CPE/CSC 103 or CPE/CSC 203. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 123.

CSC 171. Introduction to Interactive Entertainment. 4 units

Term Typically Offered: TBD

Use of click-and-drag software application to create an entertaining or informative, socially responsible application, such as a game. Team collaboration to design, develop, and test applications. Focus on design, teamwork, and using an iterative development process. An enjoyable introduction to both computer science and interactive entertainment. No computer science experience required. 3 lectures, 1 laboratory.

CSC 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

CSC 202. Data Structures. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CPE/CSC 101 with a grade of C- or better; MATH 141 or MATH 221 with a grade of C- or better; or consent of instructor.

Introduction to data structures and analysis of algorithms. Abstract datatypes. Specification and implementation of advanced data structures. Theoretical and empirical analysis of recursive and iterative algorithms. Software performance evaluation and testing techniques. Not open to students with credit in CSC/CPE 108. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 202. Formerly CPE/CSC 103.

CSC 203. Project-Based Object-Oriented Programming and Design. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CPE/CSC 202 with a grade of C- or better or consent of instructor.

Object-oriented programming and design with applications to project construction. Introduction to class design, interfaces, inheritance, generics, exceptions, streams, and testing. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 203. Formerly CPE/CSC 102.

CSC 209. Problem Solving with Computers. 1 unit

CR/NC

Term Typically Offered: TBD

Prerequisite: CSC/CPE 101 or CSC/CPE 108 with a grade of C- or better, or consent of instructor.

Reinforcement of computer science fundamentals. Review of important algorithms, language features, design, syntax, and testing techniques. Repeated application of techniques to solve problems in a constrained amount of time. Primarily intended to support students preparing for the Association for Computing Machinery's International Collegiate Programming Contest. Credit/No Credit grading only. Total credit limited to 15 units. 1 laboratory.

CSC 225. Introduction to Computer Organization. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC/CPE 202 (formerly CSC/CPE 103).

Introduction to computer systems. Simple instruction set architecture and the computer hardware needed to implement that architecture. Machine and assembly language programming. 3 lectures, 1 laboratory.

CSC 231. Programming for Engineering Students. 2 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 142; PHYS 121 or PHYS 131 or PHYS 141.

Programming techniques and procedures with applications to engineering problems. Introduction to numerical methods and simulation. Credit not allowed for CSC, Software Engineering or CPE majors. 2 activities.

CSC 232. Computer Programming for Scientists and Engineers. 3 units

Term Typically Offered: F, W

Prerequisite: MATH 118 or equivalent.

Computer programming, with an emphasis on procedural programming, taught using a language hosted by applications commonly used in science and engineering. Credit not allowed for CSC, CPE or Software Engineering majors. 2 lectures, 1 activity.

CSC 234. C and Unix. 3 units

Term Typically Offered: W

Prerequisite: MATH 142.

The C programming language and the UNIX programming environment. Operators, standard I/O functions, strings, pointers and arrays, data types and storage classes. Unix shell programming and basic I/O system calls. Credit not allowed for CSC, Software Engineering or CPE majors. 3 lectures.

CSC 235. Fundamentals of Computer Science for Scientists and Engineers I. 4 units

Term Typically Offered: TBD

Prerequisite: MATH 141 or MATH 161 with a grade of C- or better, or consent of instructor.

Introduction to the fundamentals of computer programming with an emphasis on mathematical, scientific and engineering applications: principles of algorithmic problem solving and procedural programming using a modern programming language, data types, elementary data structures, input/output and control structures. Not a substitute for CSC/CPE 101 for CSC/CPE majors or minors. 3 lectures, 1 laboratory.

CSC 236. Fundamentals of Computer Science for Scientists and Engineers II. 4 units

Term Typically Offered: TBD

Prerequisite: CSC 235 with a grade of C- or better, or consent of instructor.

Further study of computer program development with an emphasis on mathematical, scientific and engineering applications. Introduction to more complicated data types and structures. Practice of more complicated techniques of procedural programming. Introduction to the principles of object-oriented programming using a modern programming language. Detailed discussion of lists and classic list algorithms, algorithm analysis, multidimensional arrays, records, dynamic data structures, file input/output, classes. Not a substitute for CSC/CPE 202 for CSC/CPE/SE majors or minors. 3 lectures, 1 laboratory.

CSC 290. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

CSC 300. Professional Responsibilities. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC/CPE 357 and junior standing.

The responsibilities of the computer science professional. The ethics of science and the IEEE/ACM Software Engineering Code of Ethics. Quality tradeoffs, software system safety, intellectual property, history of computing and the social implications of computers in the modern world. Applications to ethical dilemmas in computing. Technical presentation methods and practice. 3 lectures, 1 laboratory.

CSC 301. Personal Software Process. 4 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 102 and CSC/CPE 103, or CSC/CPE 202 and CSC/CPE 203.

Principles and practices for defining and applying software processes to individual software development tasks. Quantitative methods for the measurement and analysis of software development cost and quality. Interpretation and evaluation of process metrics for creation of improvement plans. Adaptation of processes to individual styles. 3 lectures, 1 laboratory.

CSC 302. Computers and Society. 4 units

GE Area F

Term Typically Offered: F

Prerequisite: Junior standing and completion of GE Area B.

Social, ethical, political and technological implications and effects of computers in the modern world. Examination of the benefits and side-effects of computer applications and automation. Case study review and analysis. 4 lectures. Fulfills GE Area F.

CSC 303. Teaching Computer Science. 2 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 102 and CSC/CPE 103, with a grade of C- or better or consent of instructor, or CSC/CPE 202 and CSC/CPE 203, with a grade of C- or better or consent of instructor.

Practical coverage of educational techniques appropriate for tutoring in CSC/CPE undergraduate courses, including Socratic methods for tutoring of technical topics, design of test questions and grading rubrics, and lecture presentation. Intended for CSC/CPE/SE students interested in tutoring, grading, or a career in teaching computer science. 1 lecture, 1 laboratory. Not available for technical elective credit.

CSC 305. Individual Software Design and Development. 4 units

Term Typically Offered: W

Prerequisite: CSC/CPE 357.

Practical software development skills needed for construction of mid-sized production-quality software modules, using the CSC upper division programming language. Topics include inheritance, exceptions, and memory and disk-based dynamic data structures. Students must complete an individual programming project of mid-level complexity. 3 lectures, 1 laboratory.

CSC 307. Introduction to Software Engineering. 4 units

Term Typically Offered: F, SP

Prerequisite: CSC 141 or CSC 348; and CPE/CSC 357.

Requirements, specification, design, implementation, testing and verification of large software systems. Study and use of the software process and software engineering methodologies; working in project teams. Not open to students with credit in CSC 308. 3 lectures, 1 laboratory.

CSC 308. Software Engineering I. 4 units

Term Typically Offered: F, W

Prerequisite: CSC 141 or CSC 348; and CPE/CSC 357.

Principles for engineering requirements analysis and design of large complex software systems. Software process models. Methods of project planning, tracking, documentation, communication, and quality assurance. Analysis of engineering tradeoffs. Group laboratory project. Technical oral and written presentations. 3 lectures, 1 laboratory.

CSC 309. Software Engineering II. 4 units

Term Typically Offered: W, SP

Prerequisite: CSC 308.

Continuation of the software lifecycle. Methods and tools for the implementation, integration, testing and maintenance of large software systems. Software development and test environments. Software quality assurance. Group laboratory project. Technical presentation methods and practice. 3 lectures, 1 laboratory.

CSC 310. Computers for Poets. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B.

How computers and computer devices work. Introduction to software systems and applications. How computers connect with various media including images, speech and data. How information is encoded and transmitted across networks. Relationship between the computer and human information processing. 4 lectures. Crosslisted as CSC 310/HNRS 311. Fulfills GE Area F.

CSC 311. Computational Art. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B.

Interdisciplinary creation of static and animated computational art using algorithms. General design principles in a digital setting, including color, shape, composition, perspective, principles of animation. Development of computational tools such as variables, iteration, logic, functions. Creative expression via coding and creative coding. 3 lectures, 1 laboratory. Fulfills GE Area F.

CSC 320. Practical Computer Security for Everyone. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B.

Exploration of practical computer security in everyday life for non-majors. Covering the principles, technologies and tools used to secure the Internet and keep ourselves 'digitally' secure, including: privacy and anonymity, web and data security, cryptography, malware, authentication and access control. 3 lectures, 1 laboratory. Fulfills GE Area F.

CSC 321. Introduction to Computer Security. 4 units

Term Typically Offered: TBD

Prerequisite: CPE/CSC 357.

Survey of topics in computer system and network security, including protection, access control, distributed access control, operating system security, applied cryptography, network security, firewalls, secure coding practices, and case studies from real-world systems. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 321.

CSC 323. Cryptography Engineering. 4 units

Term Typically Offered: W

Prerequisite: CPE/CSC 357.

An introduction to the theory and practice of building secure, cryptographic systems. Core cryptographic primitives. Implementation, evaluation and subversion of widely deployed cryptographic products and protocols. 3 lectures, 1 laboratory.

CSC 325. Introduction to Privacy: Policy and Technology. 4 units

Term Typically Offered: W

Prerequisite: CSC 300.

Introduction to policies and technologies related to digital privacy. Legal decisions and policies, domestic and global cultural expectations, and privacy related technologies including applications to surveillance, big data, websites, mobile, and privacy by design. 3 lectures, 1 laboratory.

CSC 344. Music Programming. 4 units

Term Typically Offered: TBD

Prerequisite: CSC 141 or CSC 348; and CPE/CSC 357.

Music-producing programs. Software synthesizers: oscillators, coupled oscillators, wavetable synthesis. Sound processing units/filters: LTI, FIR, IIR, nonlinear. Physics of sound, mathematical foundations of sound synthesis and filtering, existing sound formats (both sampled and MIDI). 3 lectures, 1 laboratory.

CSC 348. Discrete Structures. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC/CPE 102 and CSC/CPE 103, with a grade of C- or better or consent of instructor, or CSC/CPE 202 and CSC/CPE 203, with a grade of C- or better or consent of instructor.

Structures of computer science: logic, sets, relations, functions, graphs and trees. Propositional and predicate logic. Applications of predicate logic to preconditions, postconditions, and proof techniques. Complexity of algorithms. Not open to students with credit in CSC 141. 4 lectures.

CSC 349. Design and Analysis of Algorithms. 4 units

Term Typically Offered: F, SP

Prerequisite: CSC 141 and MATH 142; or CSC 348 and MATH 142; or CPE/CSC 102 and CPE/CSC 103 and MATH 248; or CPE/CSC 202 and CPE/CSC 203 and MATH 248.

Intermediate and advanced algorithms and their analysis. Mathematical, geometrical, and graph algorithms. NP-complete problems. Additional topics will be chosen from pattern matching, file compression, cryptography, dynamic and linear programming, and exhaustive search. Course may be offered in classroom-based or online format. 3 lectures, 1 laboratory.

CSC 350. Computing for Interactive Arts Capstone I. 2 units

Term Typically Offered: TBD

Prerequisite: ART 384; CSC/CPE 102 and CSC/CPE 103, or CSC/CPE 202 and CSC/CPE 203; and junior standing.

Definition and specification of a team-based creative collaboration on a digital interactive art project (e.g. animation, video game, interactive media display, etc). Research and techniques, project planning and project team organization, prototype creation. 1 lecture, 1 laboratory. Crosslisted as ART/CSC 350.

CSC 357. Systems Programming. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC/CPE 102 and CSC/CPE 103 with a grade of C- or better or consent of instructor, or CSC/CPE 202 and CSC/CPE 203 with a grade of C- or better or consent of instructor; and CSC 225 or CPE/EE 229 or CPE/EE 233.

C programming language from a system programming perspective. Standard C language including operators, I/O functions, and data types in the context of system functions. Unix commands, shell scripting, file system, editors. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 357.

CSC 365. Introduction to Database Systems. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC 141; or CSC 348; or CPE/CSC 102 and CPE/CSC 103 and MATH 248; or CPE/CSC 202 and CPE/CSC 203 and MATH 248.

Basic principles of database management systems (DBMS) and of DBMS application development. DBMS objectives, systems architecture, database models with emphasis on Entity-Relationship and Relational models, data definition and manipulation languages, the Structured Query Language (SQL), database design, application development tools. 3 lectures, 1 laboratory.

CSC 366. Database Modeling, Design and Implementation. 4 units

Term Typically Offered: SP

Prerequisite: CSC 365.

The database modeling problem. Database modeling levels: external, conceptual, logical and physical. Database models: entity-relationship, relational, object-oriented, semantic, and object-relational. Normal forms. Distributed database design. Functional analysis of database applications and transaction specification, design, and implementation. 3 lectures, 1 laboratory.

CSC 369. Introduction to Distributed Computing. 4 units

Term Typically Offered: F, W

Prerequisite: CSC/CPE 102 and CSC/CPE 103, or CSC/CPE 202 and CSC/CPE 203; and one of the following: STAT 301, STAT 312, STAT 321 or STAT 350.

Introduction to distributed computing paradigms and cloud computing. Modern distributed computing infrastructures. Problem-solving in a distributed computing environment. 3 lectures, 1 laboratory.

CSC 371. Game Design. 4 units

Term Typically Offered: W, SP

Prerequisite: CSC/CPE 102 and CSC/CPE 103; or CSC/CPE 202 and CSC/CPE 203.

In-depth study of game design including rules, player interaction, and storytelling. Exploration of effective use of sound, art, and game controls in creating meaningful play. Development of fully functioning and engaging games, following standard domain-specific software development processes and using physical prototyping and playtesting. Current, industry-tested game engines. 3 lectures, 1 laboratory.

CSC 378. Interactive Entertainment Engineering. 4 units

Term Typically Offered: W

Prerequisite: CPE/CSC 102 and CPE/CSC 103, or CPE/CSC 202 and CPE/CSC 203.

Project-based, software oriented, design of interactive entertainment applications. Topics may include interactive storytelling, game physics, game AI, scripting, and development of virtual worlds using modeling and rendering tools. Projects require significant programming. 3 lectures, 1 laboratory.

CSC 400. Special Problems. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units.

CSC 402. Software Requirements Engineering. 4 units

Term Typically Offered: F

Prerequisite: CSC 307 or CSC 309.

Software requirements elicitation, analysis and documentation. Team process infrastructure and resource estimation to support appropriate levels of quality. Software architectural design. 3 lectures, 1 laboratory.

CSC 405. Software Construction. 4 units

Term Typically Offered: W

Prerequisite: CSC 305 and CSC 402.

Design and construction of sizeable software products. Technical management of software development teams. Software development process models, software design, documentation, quality assurance during development, software unit and integration testing; CASE tools, development environments, test tools, configuration management. 3 lectures, 1 laboratory.

CSC 406. Software Deployment. 4 units

Term Typically Offered: SP

Prerequisite: CSC 405.

Deployment of a sizeable software product by a student team. Software maintenance and deployment economic issues. Management of deployed software: version control, defect tracking and technical support. 3 lectures, 1 laboratory.

CSC 409. Current Topics in Software Engineering. 4 units

Term Typically Offered: TBD

Prerequisite: CSC 307 or CSC 309.

Selected topics in software engineering. Topics may include program generation, quality assurance, formal methods, software metrics, design methods, testing, or software development processes. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory.

CSC 410. Software Evaluation. 4 units

Term Typically Offered: TBD

Prerequisite: CSC 349; STAT 301, STAT 312, STAT 321 or STAT 350.

Theory and practice of evaluation of software and software systems. Design of experiments for measuring software performance, measuring software output quality, comparing multiple implementations of the same algorithm, and evaluation of software heuristics. Selection of appropriate software evaluation measures and criteria. 3 lectures, 1 laboratory.

CSC 422. Network and Web Security. 4 units

Term Typically Offered: W

Prerequisite: CPE 464.

Introduction to network and web security, including denial of service, botnets, access control, routing attacks, transport layer attacks, tunneling mechanisms, VPNs, IDS, firewalls, penetration testing, key distribution, browser security, social network security, email security, jamming, and wireless security. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 422.

CSC 424. Software Security. 4 units

Term Typically Offered: W

Prerequisite: CPE/CSC 307 or CPE/CSC 309; CPE/CSC 321.

Principles behind secure software design including threat models, trust management, common vulnerabilities and mitigation techniques, robust software development, isolation of untrusted code, auditability, and testing. 3 lectures, 1 laboratory.

CSC 429. Current Topics in Computer Security. 4 units

Term Typically Offered: TBD

Prerequisite: CPE/CSC 321 and CPE/CSC 357.

Selected topics in emerging areas of computer security. Potential topics include: network and web security, critical infrastructure protection, embedded systems security, malware analysis, mobile security, and digital forensics, among others. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory.

CSC 430. Programming Languages I. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC 349 and CSC/CPE 357.

Construction of the front end of a compiler including lexical analysis, syntactic analysis, type checking, and formal semantics. Introduction to regular languages, finite automata, and context-free grammars. 3 lectures, 1 laboratory.

CSC 431. Programming Languages II. 4 units

Term Typically Offered: SP

Prerequisite: CSC 430.

Language principles and design issues: bindings, conversion, parameter passing, and dynamic semantics. Language implementation: intermediate code representation, memory management, code optimization, and code generation. Functional programming languages. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 431.

CSC 435. Introduction to Object Oriented Design Using Graphical User Interfaces. 4 units

Term Typically Offered: TBD

Prerequisite: CSC 305.

Principles of object-oriented design, with emphasis on use of these principles in the design of graphical interfaces. Comparison and contrasting of two major object-oriented languages and their corresponding GUI class libraries. Language-independent object-oriented design methods, and application of these methods in the construction of a GUI-based project. Course may be offered in classroom-based or online format. 3 lectures, 1 laboratory.

CSC 436. Mobile Application Development. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC/CPE 357.

Inception, development, testing, and deployment of mobile applications. Introduction to tools, libraries, and frameworks for one or more mobile platforms and devices. Emphasis on software engineering best practices for developing entrepreneurial or humanitarian mobile-centric applications. 3 lectures, 1 laboratory.

CSC 437. Dynamic Web Development. 4 units

Term Typically Offered: SP

Prerequisite: CPE/CSC 357 with a grade of C- or better and CSC 365 with a grade of C- or better; or consent of instructor.

Project-based study of web-based three-tiered applications, including current best practices and tools for design, implementation and testing of browser interface, serverside business logic, object-relational mapping, databases, and web services. 3 lectures, 1 laboratory.

CSC 445. Theory of Computation I. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC 141 or CSC 348.

Theory of formal languages and automata. Turing machines. Chomsky hierarchy. Theory of decidability and computability. 4 lectures.

CSC 448. Bioinformatics Algorithms. 4 units

Term Typically Offered: F

Prerequisite: CSC 349.

Introduction to the use of computers to solve problems in molecular biology. The algorithms, languages, and databases important in determining and analyzing nucleic and protein sequences and their structure. 3 lectures, 1 laboratory.

CSC 450. Computing for Interactive Arts Capstone II. 2 units

Term Typically Offered: TBD

Prerequisite: ART/CSC 350.

Team-based design, construction and deployment of a collaborative interactive computational art project typically found in the fields of animation, game design, and interactive media. Management of interdisciplinary teams, documentation, creative development, testing, and assessment. 2 laboratories. Crosslisted as ART/CSC 450.

CSC 453. Introduction to Operating Systems. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC/CPE 357, and CSC/CPE 225 or CPE/EE 229 or CPE/EE 233.

Introduction to sequential and multiprogramming operating systems; kernel calls, interrupt service mechanisms, scheduling, files and protection mechanisms, conventional machine attributes that apply to operating system implementation, virtual memory management, and I/O control systems. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 453.

CSC 454. Implementation of Operating Systems. 4 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 453.

Design and implementation of multiprogramming kernels, systems programming methodology, interprocess communications, synchronization, device drivers and network access methods. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 454.

CSC 458. Current Topics in Computer Systems. 4 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 357.

Selected aspects of design, implementation and analysis of networks, advanced operating and distributed systems. Topics may include process management, virtual memory, process communication, context switching, file system designs, persistent objects, process and data migration, load balancing, security and networks. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 458.

CSC 466. Knowledge Discovery from Data. 4 units

Term Typically Offered: F, SP

Prerequisite: CSC 349 and one of the following: STAT 302, STAT 312, STAT 321 or STAT 350.

Overview of modern knowledge discovery from data (KDD) methods and technologies. Topics in data mining (association rules mining, classification, clustering), information retrieval, web mining. Emphasis on use of KDD techniques in modern software applications. 3 lectures, 1 laboratory.

CSC 468. Database Management Systems Implementation. 4 units

Term Typically Offered: SP

Prerequisite: CSC 365.

Data structures and algorithms used in the implementation of database systems. Implementation of data and transaction managers: access methods interfaces, concurrency control and recovery, query processors and optimizers. Introduction to implementation of distributed database systems. 3 lectures, 1 laboratory.

CSC 469. Distributed Systems. 4 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 357.

Foundations of distributed systems, distributed hash tables (peer-to-peer systems), failure detectors, synchronization, election, inter-process communication, consensus, replication, key-value stores, and measurements. 3 lectures, 1 laboratory. Crosslisted as CSC/CPE 469.

CSC 471. Introduction to Computer Graphics. 4 units

Term Typically Offered: TBD

Prerequisite: CPE/CSC 357.

Graphics software development and use of application programming interfaces for 3D graphics. The graphics pipeline, modeling, geometric and viewing transforms, lighting and shading, rendering, interaction techniques and graphics hardware. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 471.

CSC 473. Advanced Rendering Techniques. 4 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 471.

Illumination models, reflectance, absorption, emittance, Gouraud shading, Phong shading, raytracing polyhedra and other modeling primitives, coherence, acceleration methods, radiosity, form factors, advanced algorithms. 3 lectures, 1 laboratory.

CSC 474. Computer Animation. 4 units

Term Typically Offered: SP

Prerequisite: CSC/CPE 471.

Basic and advanced algorithms for generating sequences of synthetic images. Interpolation in time and space, procedural and keyframe animation, particle systems, dynamics and inverse kinematics, morphing and video. 3 lectures, 1 laboratory.

CSC 476. Real-Time 3D Computer Graphics Software. 4 units

Term Typically Offered: SP

Prerequisite: CSC/CPE 471.

Basic and advanced algorithms for real-time, interactive, 3D graphics software. Modeling (polygon mesh, height field, scene graph), real-time rendering and shading (visibility processing, LOD, texture and light maps), collision detection (bounding volumes, complexity management), interactive controls, multi-player game technology, game engine architecture. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 476.

CSC 477. Scientific and Information Visualization. 4 units

Term Typically Offered: F

Prerequisite: CSC 349.

Basic data processing (magnitude, grouping and segmentation), visualization design, cognition and perception, spatial data visualizations (2D and 3D, e.g. GIS data, medical data) information data visualization, spatial encoding, color encoding, and interaction. 3 lectures, 1 laboratory.

CSC 478. Current Topics in Computer Graphics. 4 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 471.

Selected aspects of the design, implementation and analysis of computer graphics. Topics may include rendering, modeling, visualization, animation, virtual reality, computer vision, multimedia, and perception issues. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory.

CSC 480. Artificial Intelligence. 4 units

Term Typically Offered: F, SP

Prerequisite: either CSC/CPE 102 and CSC/CPE 103 with a grade of C- or better or consent of instructor; or CSC/CPE 202 and CSC/CPE 203 with a grade of C- or better or consent of instructor.

Programs and techniques that characterize artificial intelligence. Programming in a high level language. 3 lectures, 1 laboratory.

CSC 481. Knowledge Based Systems. 4 units

Term Typically Offered: SP

Prerequisite: CSC 480.

In-depth treatment of knowledge representation, utilization and acquisition in a programming environment. Emphasis on the use of domain-specific knowledge to obtain expert performance in programs. 3 lectures, 1 laboratory.

CSC 483. Current Topics in Human-Computer Interaction. 4 units

Term Typically Offered: TBD

Prerequisite: CSC 484.

Selected aspects of the field of human-computer interaction. Topics may include dynamic information visualization, universal access, social impact of technology usage, educational technology, human cognition and performance studies, and extended usability evaluation techniques. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory.

CSC 484. User-Centered Interface Design and Development. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC 307 or CSC 308; junior standing.

Introduction to the importance of user-centered principles in the design of good interfaces and effective human-computer interaction. Topics include: study of human characteristics affected by interface design, effective requirements data collection and analysis, user-centered approaches to software engineering, and evaluation of interface and interaction quality. 3 lectures, 1 laboratory.

CSC 486. Human-Computer Interaction Theory and Design. 4 units

Term Typically Offered: SP

Corequisite: CSC 484.

Application of the theories of human-computer interaction to the task of user-centered design. Survey of techniques for studying and involving users in different aspects of the design process, and demonstration of where and when applicable. Combining of theoretical understanding with practical experience to design solutions to problems facing interactive systems designers. 3 lectures, 1 laboratory.

CSC 489. Current Topics in Artificial Intelligence. 4 units

Term Typically Offered: SP

Prerequisite: CSC 480.

Selected aspects of the design, implementation and analysis of advanced systems and concepts in the area of artificial intelligence. Topics may include knowledge representation, reasoning, learning, or planning, and specific techniques like intelligent agents, genetic algorithms, semantic web, or robotics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 lectures, 1 laboratory.

CSC 490. Selected Advanced Topics. 1-4 units

Term Typically Offered: SP

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

CSC 491. Senior Project I. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CSC 307 or CSC 309; and consent of instructor.

Selection and completion of a project by individuals or team which is typical of problems which graduates must solve in their fields of employment. Project may include students from other disciplines. Formulation of outline, literature review, and project schedule.

CSC 492. Senior Project II. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CSC 491 and consent of instructor.

Selection and completion of a project by individuals or team which is typical of problems which graduates must solve in their fields of employment. Project may include students from other disciplines. Project results are presented in a formal report.

CSC 493. Cooperative Education Experience. 2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units.

CSC 494. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units.

CSC 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

CSC 496. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: SP

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

CSC 500. Directed Study. 2-3 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Fully classified graduate standing and consent of instructor.

Individual directed study of advanced topics. Total credit limited to 4 units. Credit/No Credit grading only.

CSC 508. Software Engineering I. 4 units

Term Typically Offered: TBD

Prerequisite: CSC 307 or CSC 308 and graduate standing, or consent of instructor.

In-depth study of requirements engineering, software project management, formal specifications and object-oriented analysis. 4 seminars.

CSC 509. Software Engineering II. 4 units

Term Typically Offered: SP

Prerequisite: CSC 508 and graduate standing, or consent of instructor.

In-depth study of software modeling and design. Formal design methodologies. Design patterns. Detailed case studies of existing projects. Tools and methods for designing large software systems. 4 seminars.

CSC 515. Computer Architecture. 4 units

Term Typically Offered: F

Prerequisite: CPE 315 and graduate standing, or consent of instructor.

Comparative study and design of multiprocessor, dataflow, RISC, high level language and other new computer architectures. VLSI processor design techniques. 3 seminars, 1 laboratory. Crosslisted as CPE/CSC 515.

CSC 521. Computer Security. 4 units

Term Typically Offered: TBD

Prerequisite: CPE/CSC 321 and graduate standing.

Exploration of advanced topics in computer security with an emphasis on research topics. 3 lectures, 1 laboratory.

CSC 530. Languages and Translators. 4 units

Term Typically Offered: SP

Prerequisite: CSC 430 and graduate standing, or consent of instructor.

Advanced programming language and translator concepts. Language concepts to be covered will be selected from current state-of-the-art languages and current issues in language design. Compiler concepts will include retargetable code generation, use of translator-writing systems, and error recovery. 4 seminars.

CSC 540. Theory of Computation II. 4 units

Term Typically Offered: W

Prerequisite: CSC 445 and graduate standing, or consent of instructor.

Advanced topics in theoretical computer science from such areas as automata theory, cellular automata theory, computational complexity, and program verification. 4 seminars.

CSC 550. Operating Systems. 4 units

Term Typically Offered: TBD

Prerequisite: CSC/CPE 453 and graduate standing, or consent of instructor.

General concepts of computer architecture and operating systems. Design features of advanced computers, general time-sharing systems and schemes for dynamic memory allocation, scheduling and protection. Dynamic linkage between subroutines. Intercommunication between input/output and processors. 4 seminars.

CSC 560. Database Systems. 4 units

Term Typically Offered: TBD

Prerequisite: CSC 365 and graduate standing, or consent of instructor.

Current topics in database systems: distributed databases and transactions, nested and long-running transactions, distributed concurrency control, semantic and object-oriented data models, database systems for non-traditional applications: engineering design databases, active, logic, temporal, multimedia, and real-time databases. 4 seminars.

CSC 564. Computer Networks: Research Topics. 4 units

Term Typically Offered: W

Prerequisite: CSC/CPE 464 and graduate standing, or consent of instructor.

Exploration of advanced topics in emerging computer networking technologies; focus on leading edge computer network research topics. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 564.

CSC 566. Topics in Advanced Data Mining. 4 units

Term Typically Offered: SP

Prerequisite: CSC 466 or CSC 480 or CSC 582.

Advanced topics in the areas of data mining, knowledge discovery in data, machine learning, information retrieval and intelligent analysis of information. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

CSC 569. Distributed Computing. 4 units

Term Typically Offered: TBD

Prerequisite: CSC 141 or CSC 348; and CPE/CSC 357; or graduate standing and consent of instructor.

Principles and practices in distributed computing: interprocess communications, group communications, client-server model, distributed objects, message queue system, distributed services, mobile agents, object space, Internet protocols. Distributed algorithms: consensus protocols, global state protocols. Fault tolerance: classification of faults, replication. 3 lectures, 1 laboratory. Crosslisted as CPE/CSC 569.

CSC 570. Current Topics in Computer Science. 2-4 units

Term Typically Offered: F, W

Prerequisite: Graduate standing and evidence of satisfactory preparation in computer science.

Directed group study of selected topics for graduate students. Topics will normally consist of continuations of those in CSC 520, CSC 530, CSC 540, CSC 550, CSC 560 and CSC 580, and other topics as needed. Class Schedule will list topic selected. Topic credit limited to 12 units. 2 to 4 seminars.

CSC 572. Computer Graphics. 4 units

Term Typically Offered: F

Prerequisite: Successful completion of CSC/CPE 471 and graduate standing, or consent of instructor.

Advanced topics in computer graphics with emphasis on leading edge computer graphics technologies and advanced topics in graphics fundamentals. 3 lectures, 1 laboratory.

CSC 580. Artificial Intelligence. 4 units

Term Typically Offered: W

Prerequisite: CSC 480 and graduate standing, or consent of instructor.

Current research in the field of artificial intelligence with emphasis on cooperative agents, distributed agents, and decision making in complex, concurrent environments. AI programming in a distributed environment. 3 lectures, 1 laboratory.

CSC 581. Computer Support for Knowledge Management. 4 units

Term Typically Offered: TBD

Prerequisite: CSC 480 or CSC 484 or consent of instructor.

Methods and techniques that computer-based systems can provide to make the management of knowledge and information in digital form easier for the user. Emphasis on support for knowledge-intensive activities performed by users. 3 lectures, 1 laboratory.

CSC 582. Introduction to Natural Language Processing. 4 units

Term Typically Offered: TBD

Prerequisite: CSC 466 or CSC 480 or graduate standing. Recommended: CSC 580.

Classic Natural Language Processing systems and techniques; review of recent advancements in the subject. Topics selected from: parsing, tagging, word-sense disambiguation, natural language generation, data mining, voice recognition, vocalization, knowledge management, semantic networks, stylistics and machine learning. 3 lectures, 1 laboratory.

CSC 590. Thesis Seminar. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing or consent of instructor.

Preparation for conducting research in the field of computer science, through discussions, selected readings, and student presentations. 1 seminar.

CSC 593. Cooperative Education Experience. 2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only.

CSC 594. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only.

CSC 595. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only.

CSC 596. Thesis I. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor. Corequisite: CSC 590.

Individual research or activity under faculty supervision, beginning work on the master's thesis.

CSC 597. Thesis II. 3 units

Term Typically Offered: F, W, SP

Prerequisite: CSC 596 and consent of instructor.

Individual research or activity under faculty supervision, continuing work on the master's thesis.

CSC 599. Thesis III. 3 units

Term Typically Offered: F, W, SP

Prerequisite: CSC 597, selection of thesis committee, graduate standing, and consent of instructor.

Individual research or activity under faculty supervision leading to an acceptable thesis.

Construction Management (CM)

CM Courses

CM 102. Introduction to Construction Management. 2 units

Term Typically Offered: F, W, SP

Introduction to the fundamental concepts and overview of the essential elements associated with the construction profession, to include: construction trends, ethics, safety and health issues, and professional practice methods. 2 lectures.

CM 113. Construction Materials and Assemblies. 2 units

Term Typically Offered: F, W, SP

Recommended: CM 102.

Exploration of the various materials, assemblies, and processes used and applied in the building construction process. Includes presentation, discussion, analysis, study and research of construction materials and assemblies. 2 lectures.

CM 114. Construction Materials and Assemblies Lab. 2 units

Term Typically Offered: F, W, SP

Corequisite: CM 113. Recommended: CM 102.

Exploration of the various materials, assemblies, and processes used and applied in the building construction process. Includes presentation, discussion, analysis, study and research of construction materials and assemblies. 2 laboratories.

CM 115. Fundamentals of Construction Management. 6 units

Term Typically Offered: F, W, SP

Prerequisite: ARCE 106 or CM 113; MATH 141; and PHYS 141.

Production of drawings and specifications for residential and light commercial construction. Integration of scheduling, estimating, codes, and contracts with a project based approach. Manual drawing techniques and computer aided drafting with building information modeling develop visualization skills for architectural systems. 4 laboratories, 2 activities.

CM 212. Construction Management Principles. 3 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Introduction to the fundamental concepts of construction management. Primary areas of focus are quantity surveying and basic scheduling techniques. Additional topics of study to include work activity durations and sequencing, and computer applications in scheduling. Course does not satisfy approved technical elective requirement for CM majors. 3 laboratories.

CM 214. Residential Construction Management. 5 units

Term Typically Offered: F, W, SP

Prerequisite: CM 115, PHYS 132 or CHEM 124. Corequisite: CM 232.

Materials, methods, and techniques associated with residential and light commercial construction operations. Topics include shallow foundations, timber and masonry framing, roofing, and exterior and interior finishes. Scheduling, estimating, and construction contracts are integrated into a project based approach. 3 laboratories, 2 activities.

CM 221. Concrete and Formwork Technology. 3 units

Term Typically Offered: TBD

Prerequisite: ARCH 106.

Modern concepts of concrete and formwork construction. Significant developments in concrete chemistry and strength theory. Formwork systems, concrete mix design, admixtures, batching, finishing, curing and testing. Includes physically building basic forms, finishing and curing concrete, and testing of designed mixes. 2 lectures, 1 laboratory.

CM 232. Evaluation of Cost Alternatives. 3 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 142 or MATH 182.

Basic principles of economic evaluations using fundamental concepts of time value of money to compare cost alternatives related to construction, design, and real property development. 3 lectures.

CM 239. Construction Surveying. 4 units

Term Typically Offered: SU

Prerequisite: MATH 119 or equivalent.

Theory and practice of plane surveying with an emphasis on construction applications. Topics include property use and care of survey equipment and instruments, distance measurement, leveling, angular measurement, construction layout, basic roadwork, and as-built surveys. 3 lectures, 1 laboratory.

CM 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

CM 280. Building Information Modeling. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CE 113 or CM 115.

Use of building information modeling software to emphasize residential, commercial, and heavy civil assembly methods and techniques. BIM drafting applications integrated with construction materials, details, and assemblies supporting the understanding of the construction building process. 2 activities.

CM 310. Construction Means and Methods. 4 units

Term Typically Offered: F, SP

Prerequisite: CM 113.

Construction means, methods, and techniques related to the built environment including residential, commercial, heavy civil and HVACR construction. Focus on the major construction material assemblies and systems with an emphasis on constructability, best practices, and application. Field trips required. 4 lectures.

CM 313. Commercial Construction Management. 5 units

Term Typically Offered: F, W, SP

Prerequisite: CM 214 and ARCE 212.

Materials, methods, and techniques associated with large commercial and institutional construction operations. Topics include building systems analysis of foundations, waterproofing, structural framing, exterior cladding, and finishes. Scheduling, estimating, and construction contracts are integrated into a project based approach. 3 laboratories, 2 activities.

CM 314. Heavy Civil Construction Management. 5 units

Term Typically Offered: F, W, SP

Prerequisite: CM 313. Corequisite: CM 334.

Materials, methods, and techniques associated with civil engineering projects and heavy construction operations. Topics include tunnel, bridge, dam, and road construction; equipment selection; and temporary structures. Scheduling, estimating, and construction contracts are integrated into a project based approach. 3 laboratories, 2 activities.

CM 317. Sustainability and the Built Environment. 4 units

GE Area F

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing and completion of GE Area B.

Interdisciplinary analysis of sustainable strategies and technologies to enhance the built environment. A systems approach to green building science that includes sustainable site development, water use efficiency, renewable energy, improving material use, indoor environmental quality, and design innovation. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE Area F.

CM 334. Construction Law. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CM 115 and BUS 207.

The intersection of law and the construction industry. Topics of study include a survey of most major legal issues potentially encountered during construction activity. 2 activities.

CM 335. Construction Accounting. 2 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 215 and CM 232.

Fundamentals of construction accounting principles to include income recognition, job cost control, cash flow analysis and associated cost reports. 2 activities.

CM 371. Construction Management and Project Planning. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ARCE 106, CE 259 or CM 113.

Theory and practice of planning, scheduling, estimating, and reporting for construction projects. Fundamentals of scheduling logic including critical path, deterministic, and probabilistic scheduling; including the impact of constraints. Identifying resources and estimating time requirements for design activities and project operations. Not open to Architectural Engineering or Construction Management majors. 3 lectures, 1 activity. Crosslisted as CE/CM 371.

CM 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 6 units, with a maximum of 4 units per quarter.

CM 411. Specialty Contracting Construction Management. 5 units

Term Typically Offered: F, W, SP

Prerequisite: CM 313.

Materials, methods, and techniques associated with mechanical, electrical, and plumbing systems. Topics include heating, ventilating, air conditioning, power distribution, grounding, lighting, communication, fire detection/protection, and plumbing. Integration of scheduling, estimating, and construction subcontracts with a project based approach. 3 laboratories, 2 activities.

CM 413. Jobsite Construction Management. 5 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CM 313.

Management activities applicable to the construction process involving techniques, applications, and theory needed in a jobsite environment. Addresses the relationships, roles, and perspectives of all stakeholders. Integrated utilization of temporary structures associated with field construction. 3 laboratories, 2 activities.

CM 415. Integrated Project Delivery. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CM 413 and CM 480.

Team based collaborative effort to analyze and evaluate the unique interdisciplinary challenges associated with coordinating and integrating the design and construction processes to deliver a project with respect to the design, budget, schedule, quality, and performance expectations of a client. Not open to students with credit in CM 450. 4 laboratories.

CM 420. Service / Experiential Learning. 1-6 units

Term Typically Offered: SP

Prerequisite: Third-year standing.

Service and project-based learning and teaching techniques as applied to a variety of construction management concepts. Goals and objectives achieved through service-learning, project-based, and/or experiential pedagogical approaches. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities.

CM 421. Emerging Trends. 1-6 units

Term Typically Offered: F, SP

Prerequisite: Third-year standing.

Emerging trends related to construction management concepts and practices. Goals and objectives achieved through analysis, study, and research of a particular construction emerging trend. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities.

CM 422. Professional Preparation. 1-6 units

Term Typically Offered: F, W, SP

Prerequisite: Third-year standing.

Professional practice related to the construction management industry. Goals and objectives achieved through analysis, study, and preparation for a particular professional practice. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 6 activities.

CM 423. Construction Materials / Assemblies. 1-6 units

Term Typically Offered: W

Prerequisite: Third-year standing.

Various materials and assemblies related to construction process. Goals and objectives achieved through analysis, study, and research of a particular construction material and/or assembly. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities.

CM 424. Construction Technology. 1-6 units

Term Typically Offered: SP

Prerequisite: Third-year standing.

Technology related to construction management education and the construction industry. Goals and objectives achieved through analysis, study, and research of a particular construction technology. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities.

CM 425. Sustainability and Environment. 1-6 units

Term Typically Offered: W

Prerequisite: Third-year standing.

Sustainable and environmental issues related to the construction industry. Goals and objectives achieved through analysis of a particular construction related sustainable and/or environmental issue. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities.

CM 426. International Construction Studies. 1-6 units

Term Typically Offered: SU

Prerequisite: Third-year standing.

Exploration of international construction studies through several potential teaching techniques, including field trips to countries overseas, research and case studies of companies and projects, and management skills and leadership as they relate to international construction. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-6 activities.

CM 432. Design-Build Project Management. 3 units

Term Typically Offered: TBD

Prerequisite: Minimum junior standing.

Management issues applicable to the design and construction integration method of project delivery. Project sponsor/project advocate techniques, monitoring the evolving design, detecting and controlling change, early warning systems, cost trending, schedule impacts, cost impacts, systems integration, contract/scope modifications, procurement, contingencies, quality, and overall process control. 3 activities.

CM 433. Integrated Project Delivery. 2 units

Term Typically Offered: TBD

Prerequisite: CM 214.

Investigation and analysis of special advanced topics in Integrated Project Delivery including Design-Build, CM-at-Risk, Alliance Contracting and other alternative delivery models and application across a wide range of project types. Topics include source selection, acquisitions, contracting, performance criteria, design management, and others. 2 activities.

CM 443. Management of the Construction Firm. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CM 334; CM 335; and CM 413.

Applications of strategic management techniques and business strategy for managing and long-range planning of the construction firm. 3 activities.

CM 450. Integrated Project, Design and Program Management. 5 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CM 313 and CM 334.

Evaluation of roles and relationships of owner, designer, and construction professionals over project life cycles. Modeling, conceptual estimating, lean scheduling, contract selection, integrated delivery, design management, program management, and influential leadership strategies and techniques. Not open to students with credit in CM 415. 3 laboratories, 2 activities.

CM 460. Senior Project Methodology. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CM 313; junior standing; Construction Management majors only.

Introduction to senior project processes, timelines, requirements, and best practices including topic selection, literature review, methodology, and paper formatting. 2 lectures.

CM 461. Senior Project I. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: CM 460 and consent of project advisor. See department for additional guidelines and requirements.

Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. Student proposal must be submitted and approved by project advisor prior to registration for course. Construction and team projects encouraged.

CM 462. Senior Project II. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: CM 460 and consent of project advisor. See department for additional guidelines and requirements.

Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. Student proposal must be submitted and approved by project advisor prior to registration for course. Construction and team projects encouraged.

CM 463. Senior Project: Professional Practice for Constructors. 3 units

Term Typically Offered: TBD

Prerequisite: CM 413. Corequisite: CM 443.

Practical application of construction management theory and practice solving problems related to the built environment. 3 laboratories.

CM 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

CM 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

CM 475. Real Property Development Principles. 4 units

Term Typically Offered: SP

Prerequisite: Minimum junior standing.

Development process and its major actors: investors, developers, government agencies, environmental and local stakeholders; their development roles, objectives, approaches. Basics of urban markets and economics, financing, regulation, public planning; value added, contractual, environmental and community context factors. 4 lectures.

CM 480. Preconstruction Integration and Planning. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CM 313.

Examination of the role of preconstruction services, team integration, and joint design planning in several Integrated Project Delivery (IPD) approaches. Various tools and techniques associated with preconstruction services and design planning from the proposal stage through the design stages of a project. 2 activities.

CM 485. Cooperative Education Experience. 1-6 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Full-time work experience in an area directly related to the construction industry for 3 months. Positions are paid and usually require relocation and registration in course for one quarter. Registration in course is required at start of work experience. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. May be repeated for credit. Major credit limited to 6 units; total credit limited to 12 units. See department for additional requirements.

CM 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Full-time work experience in an area directly related to the construction industry for 6 months. Positions are paid and usually require relocation for two consecutive quarters. Registration in course is required at start of work experience. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. May be repeated for credit. Major credit limited to 6 units; total credit limited to 24 units. See department for additional requirements.

CM 510. Principles of Integrated Facility Management. 4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Examination of the facility management profession and all functions associated with it, including strategic planning, financial planning, budgeting, project management, operations and maintenance, sustainability, and emergency preparedness, and how those functions interface with the overall goals of the business enterprise. Course offered online only. 4 lectures.

CM 511. Facility Risk Analysis and Project Management. 4 units

Term Typically Offered: TBD

Prerequisite: CM 510 or IFMA's CFM certification.

Examination of the full range of financial risks and management strategies associated with facilities including asset management, real estate options, budget development, analysis and cost control, project management, contracting methods for design and construction, and procurement approaches. 4 lectures.

CM 512. Facility Maintenance and Operation Strategies. 4 units

Term Typically Offered: TBD

Prerequisite: CM 510 or IFMA's CFM certification.

Examination of the various strategies associated with the oversight and management of operations and maintenance of the internal and external systems, equipment, and building functions associated with the physical plant of real estate assets. 4 lectures.

CM 513. Facility Systems Assessment and Integration. 4 units

Term Typically Offered: TBD

Prerequisite: CM 510 or IFMA's CFM certification.

Examination of how facility conditions assessments and the integration of systems through computerized, intelligent networks of electronic devices designed to monitor and control the mechanical electronics, lighting systems, access, and security systems enhance building performance and ease of operation over its life-cycle. 4 lectures.

CM 514. Sustainable Facility Management. 4 units

Term Typically Offered: TBD

Prerequisite: CM 510 or IFMA's CFM certification.

Examination of the basics of environmental sustainability as applied to new or existing facilities and the identification of skills, tools, and techniques necessary to make effective and sustainable facility management and operations decisions that align with the organization's sustainability goals and objectives. 4 lectures.

CM 515. Environmental Health and Safety Management for Facilities. 4 units

Term Typically Offered: TBD

Prerequisite: CM 510 or IFMA's CFM certification.

Examination of major safety and environmental regulations, regulatory implications, and how best to minimize associated risk. Examination of emergency preparedness at both a macro and micro level, from planning for an emergency through recovering from disasters. 4 lectures.

CM 521. Construction Cost Estimating and Work Procurement. 4 units

Term Typically Offered: TBD

Prerequisite: Consent of program coordinator.

Examination of the construction discipline of cost estimating and pre-construction activities, emphasizing both the core and higher functions associated with types of estimates, measuring and pricing, bidding procedures and strategies, procurement, pre-construction services, budget, and cost control analysis. 4 lectures.

CM 522. Construction Planning, Scheduling, and Impact Analysis. 4 units

Term Typically Offered: TBD

Prerequisite: Consent of program coordinator.

Examination of the construction discipline of planning, scheduling, management, and control relating to both core and higher functions associated with network diagram analysis, CPM scheduling, project diagnostics, short interval, resource loaded, pull scheduling, forecasting, and earned value management techniques. 4 lectures.

CM 523. Construction Contracts and Law. 4 units

Term Typically Offered: TBD

Prerequisite: Consent of program coordinator.

Examination of the discipline of law and contracts as they relate to the construction industry, including both the core and higher functions associated with the construction process, business organization, employment responsibilities, liability, damages, claims, dispute resolution, and risk management. 4 lectures.

CM 524. Construction Project Management and Control. 4 units

Term Typically Offered: TBD

Prerequisite: Consent of program coordinator.

Examination of the discipline of construction project management and control relating to both the core and higher functions associated with the construction process, pre-construction services, and management in the areas of safety, quality, resource, risk, schedule, budget, changes, and value. 4 lectures.

CM 525. Construction Workforce, Productivity, and Safety. 4 units

Term Typically Offered: TBD

Prerequisite: Consent of program coordinator.

Examination of the disciplines of workforce productivity and safety as they relate to the construction industry, including both the core and higher functions associated with field personnel management, construction operations, lean construction techniques, equipment utilization, productivity, and OSHA regulations. 4 lectures.

CM 570. Selected Advanced Topics in Construction Management. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed study of selected topics in Construction Management. Class Schedule will list topic selected. Total credit limited to 12 units. 4 seminars.

CM 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

Dairy Science (DSCI)

DSCI Courses

DSCI 100. Enterprise Project. 1-4 units

CR/NC

Term Typically Offered: TBD

Selection and completion of a management/production project under faculty supervision. Project participation is subject to approval by the project supervisor and the Cal Poly Corporation. Degree credit limited to 12 units. Credit/No Credit grading only.

DSCI 102. Dairy Operations and Safety. 2 units

Term Typically Offered: F, SP

Dairy farm biosecurity, animal handling and welfare, equipment operation, employee safety and hazard analysis. Instruction in standard operating procedures (SOP) relevant to milking, transition cow and calf management and cattle identification. 2 activities.

DSCI 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

DSCI 202. Dairy Promotion and Marketing. 4 units

Term Typically Offered: F

Prerequisite: DSCI 230 and DSCI 231.

National and state dairy promotional programs, advertising and merchandising. Marketing and pricing of milk and dairy products at the state and national level. 4 lectures.

DSCI 230. General Dairy Husbandry. 4 units

Term Typically Offered: F, W, SP

Selection, breeding, feeding, and management of dairy cattle. Composition and food value of dairy products. Milk pricing, political influences, dairy industry statistics and opportunities. Producing and handling products. Intended as introductory course for non-dairy science majors. 3 lectures, 1 laboratory.

DSCI 231. General Dairy Manufacturing. 4 units

Term Typically Offered: F, SP

Composition and properties of fluid milk and manufactured milk products. Chemistry and microbiology of dairy products. Processes and equipment involved in the manufacture of butter, cheeses, and other fermented dairy products, frozen, condensed, and dried dairy foods. 3 lectures, 1 activity.

DSCI 233. Milk Processing and Inspection. 4 units

Term Typically Offered: W

Prerequisite: DSCI 231, or FSN 125, or FSN 230.

Composition and properties of fluid milk and its constituents. Equipment used to handle, process, and distribute fluid milk and related products. California dairy codes used for dairy farms and plants, with practice inspections of dairy farms and factories. 3 lectures, 1 laboratory.

DSCI 241. Dairy Cattle Selection, Breeds, Fitting and Showing. 4 units

Term Typically Offered: SP

Prerequisite: DSCI 230.

Selection of dairy cattle on type conformation and the correlation between type and production. Dairy cattle breeds and breed comparisons. Techniques to properly condition, groom and present dairy cattle for evaluation and merchandising. 2 lectures, 2 activities.

DSCI 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

DSCI 301. Dairy Cattle Nutrition. 4 units

Term Typically Offered: F, SP

Prerequisite: ASCI 220.

Nutrition principles to maximize milk production. Ruminal and post ruminal digestion, post absorptive metabolism, nutrient interactions and microbiology. Modern techniques to manipulate and increase animal efficiency. Use of computer models to evaluate and precisely formulate diets. 3 lectures, 1 activity.

DSCI 321. Lactation Physiology. 4 units

Term Typically Offered: F

Prerequisite: ASCI 220; DSCI 230; and BIO 111 or BIO 161.

Mechanisms of milk component secretion, including protein, lactose and fat metabolism. Disorders of the mammary gland (mastitis) and control strategies. Endocrine aspects of mammary gland development and lactogenesis. 4 lectures.

DSCI 330. Artificial Insemination and Embryo Biotechnology. 4 units

Term Typically Offered: F

Prerequisite: ASCI 229 or DSCI 230.

Techniques in the collection, evaluation and processing of semen, along with embryo culturing and manipulation. Insemination procedures, fertility problems, record keeping, estrous synchronization, endocrine control of reproduction, treating reproductive disorders and embryo transfer. 3 lectures, 1 laboratory.

DSCI 333. Dairy Animal Health, Safety and Applied Technology. 4 units

Term Typically Offered: W

Prerequisite: ASCI 220 and DSCI 230.

Application of principles of herd health, biosecurity, lactation physiology, cattle management and reproductive physiology to successful dairy operations. Assessment of animal comfort and general health and well-being. Practical techniques in safe animal handling. 3 lectures, 1 activity.

DSCI 339. Internship in Dairy Science. 1-12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Consent of internship instructor.

Selected Dairy Science students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Degree credit limited to 12 units. Credit/No Credit grading only.

DSCI 340. Dairy Waste Management and Resource Recovery. 3 units

Term Typically Offered: TBD

Prerequisite: MCRO 221.

Management of dairy wastes to protect the environment while providing a return on investment. Selection of waste management systems, considering capital and operating costs and benefits from nutrient, biogas, and heat recovery. Best practices that meet current regulatory requirements. 3 lectures.

DSCI 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

DSCI 401. Physical and Chemical Properties of Dairy Products. 4 units

Term Typically Offered: F

Prerequisite: Junior standing. Recommended: CHEM 312.

Composition, structure and properties of milk and milk products. Physical and chemical changes that occur during processing and storage of dairy products. Objective measurement of chemical and physical properties. 3 lectures, 1 laboratory.

DSCI 402. Quality Assurance and Control of Dairy Products. 4 units

Term Typically Offered: SP

Prerequisite: DSCI 444 or MCRO 421.

Current methods used to evaluate dairy products with respect to plant economics and consumer safety. Accurate procedures for chemical and biological testing, statistical approach to sampling and design and interpretation of HACCP programs for assuring product quality and safety. 3 lectures, 1 laboratory.

DSCI 410. Advanced Dairy Nutrition. 4 units

Term Typically Offered: F

Prerequisite: ASCI 229; and ASCI 355 or DSCI 301.

Nutrient metabolism and diet formulation technologies for all classes of dairy cattle; whole-farm feed management; physiological and nutritional aspects of predominant metabolic disorders; on-farm auditing and troubleshooting of nutritional management. Field trip required. 3 lectures, 1 laboratory.

DSCI 412. Dairy Farm Consultation. 4 units

Term Typically Offered: W

Prerequisite: DSCI 333.

Student consultation teams of three or four students visit dairies and/or attend management training seminars followed by presenting management recommendations to the dairy owners, consultants, and other industry leaders. 1 seminar and supervised work.

DSCI 422. Breeding and Genetics of Dairy Cattle. 4 units

Term Typically Offered: SP

Prerequisite: DSCI 241, BIO 111 or higher, STAT 130 or higher.

Evaluation of inherited characteristics in dairy cattle, including principles of inheritance and genomic evaluations. Proving and selecting sires and dams, dairy genetic evaluations. 4 lectures.

DSCI 432. Advanced Dairy Herd Management. 4 units

Term Typically Offered: W

Prerequisite: DSCI 333.

Dairy herd management skills needed in dairy operations. Instruction and lab experience in management, records, labor, waste management, and milking management. 4 lectures.

DSCI 433. Dairy Plant Management and Equipment. 4 units

Term Typically Offered: F

Prerequisite: DSCI 233 or FSN 204.

Basic management principles applied to the dairy industry. Industrial organization and control. Dairy plant design, facilities, layout. Inventory control and records. Milk pooling and stabilization records. Maintenance and operation of equipment. 3 lectures, 1 laboratory.

DSCI 434. Cheese and Fermented Dairy Foods. 4 units

Term Typically Offered: W

Prerequisite: DSCI 231; MCRO 221 or MCRO 224; and STAT 218.

Recommended: CHEM 313.

Scientific methods, ingredients, and equipment used in the manufacture of various fermented dairy products, including cheeses, buttermilk, sour cream, and yogurt. 3 lectures, 1 laboratory.

DSCI 435. Concentration and Fractionation Technology. 4 units

Term Typically Offered: SP

Prerequisite: DSCI 233 or FSN 204.

Technology of evaporation, drying and membrane separation processes applied to dairy fluids. Design and performance of evaporators, driers, and membrane processing systems. Equipment, ingredients, and methods needed to manufacture butter and dairy spreads. 3 lectures, 1 laboratory.

DSCI 444. Dairy Microbiology. 4 units

Term Typically Offered: TBD

Prerequisite: DSCI 233; and MCRO 221 or MCRO 224; and STAT 130 or STAT 218; or graduate standing.

Microorganisms involved in the fermentation and ripening processes in the dairy industry, as well as those involved in spoilage of milk and dairy products, in the transmission of disease through these products, and indicator systems used to determine sanitary quality of these products. 3 lectures, 1 laboratory.

DSCI 461. Senior Project. 3 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Selection and completion of a project under faculty supervision. Projects are typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal written report. 2 lectures and supervised work.

DSCI 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

DSCI 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

DSCI 500. Individual Study in Dairy Science. 1-6 units

Term Typically Offered: TBD

Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

Advanced independent study planned and completed under the direction of a member of the Dairy Science faculty. Total credit limited to 6 units.

DSCI 501. Dairy Chemistry. 3 units

Term Typically Offered: F

Prerequisite: CHEM 212 or CHEM 312; admission to Master of Professional Studies program in Dairy Products Technology.

Recommended: Differential and Integral Calculus.

Composition, structure/functional relationships and properties of milk, milk components and products. Physical, chemical and biochemical changes that occur during processing, storage and use of milk and milk components. Chemical, physical, functional and nutritional properties of milk components. 3 lectures.

DSCI 502. Dairy Chemistry Laboratory. 2 units

Term Typically Offered: W

Prerequisite: DSCI 501; admission to Master of Professional Studies program in Dairy Products Technology.

Objective measurements, analysis and isolation of milk components. Experimental demonstration of chemical and physical reactions of milk components during typical processing conditions. 2 laboratories.

DSCI 510. Dairy Foods: Issues and Practices. 2 units

Term Typically Offered: F

Prerequisite: Admission to Master of Professional Studies program in Dairy Products Technology.

Contemporary issues in the dairy foods and allied industries. Consumer, political, environmental, regulatory, producer, technological, scientific, and economic considerations critical to future industry leaders. Required field trips to the dairy foods processing industry in California. 1 lecture, 1 activity.

DSCI 520. Dairy Processing and Manufacturing I. 3 units

Term Typically Offered: F

Prerequisite: Admission to Master of Professional Studies program in Dairy Products Technology. Concurrent: DSCI 540.

Principles of unit operations involving heat and mass transfer including pasteurization and related thermal processes, centrifugal separation, concentration processes, churning and related high shear extrusion, fractionation processes, freezing, and drying technologies. Pneumatic and mechanical devices and systems. 2 lectures, 1 laboratory.

DSCI 521. Dairy Processing and Manufacturing II. 4 units

Term Typically Offered: W

Prerequisite: DSCI 520; admission to Master of Professional Studies program in Dairy Products Technology.

Unit operations in process systems for the efficient manufacture of fluid milk products, cream, butter, and concentrated milk. Process variables and their control, system integration. Use of processes to manipulate physical and chemical properties to influence product quality. 3 lectures, 1 laboratory.

DSCI 524. Dairy Processing and Manufacturing III. 4 units

Term Typically Offered: SP

Prerequisite: DSCI 520.

Unit operations in process systems for the efficient manufacture of fermented milks, cheese, frozen desserts, and dried milk and whey products. Process variables and their control, system integration for these products. 3 lectures, 1 laboratory.

DSCI 535. Dairy Foods Ingredient Functionality. 4 units

Term Typically Offered: SP

Prerequisite: DSCI 501.

Identification and industrial use of functional milk fractions. Physical, chemical, and sensory properties of milk fractions. Objective and sensory measurements of milk ingredients as used in food and beverage products. 3 lectures, 1 laboratory.

DSCI 539. Graduate Internship in Dairy Science. 1-9 units

Term Typically Offered: SU

Prerequisite: Consent of internship instructor.

Application of theory to the solution of problems of agricultural production or related business in the field of Dairy Science. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units.

DSCI 540. Graduate Dairy Microbiology. 4 units

Term Typically Offered: F

Prerequisite: Admission to Master of Professional Studies program in Dairy Products Technology. Concurrent: DSCI 520. Recommended: MCRO 221 or equivalent.

Raw milk microbiological principles, pasteurization and microorganisms in dairy foods safety, microbiological analysis of dairy products, fermented milks and cheese, starters and probiotics, commercial practices and sources of information for regulation on microbial aspects of dairy foods. 2 lectures, 2 laboratories.

DSCI 541. Quality Assurance, Quality Control and Food Safety. 4 units

Term Typically Offered: W

Prerequisite: Admission to Master of Professional Studies program in Dairy Products Technology.

Concepts and methodologies used in dairy industry and dairy food plants for assurance and control of the quality of finished product. Basis for understanding physical, chemical and microbiological methods as they apply to quality evaluation of dairy foods. 3 lectures, 1 laboratory.

DSCI 560. Recent Developments in Dairy Science and Technology. 1-3 units

Term Typically Offered: TBD

Prerequisite: Senior or graduate standing and approval of instructor.

Presentation and critical review of current research publications. Methodological advances and applications in dairy food systems. Class Schedule will list topic selected. Total credit limited to 6 units. 1-3 seminars.

DSCI 565. Industrial Plant Considerations for Sustainable Operation. 4 units

Term Typically Offered: SP

Prerequisite: DSCI 520; admission to Master of Professional Studies program in Dairy Science Technology.

Plant site selection considerations, project management, plant design and layout, management of productivity maintenance, plant improvement project selection criteria, working with regulatory environment, community relations, and personal safety for overall industrial plant sustainability. 3 lectures, 1 activity.

DSCI 570. Selected Topics in Dairy Science. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 12 units. 1 to 4 seminars.

DSCI 571. Selected Advanced Laboratory in Dairy Science. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

DSCI 581. Graduate Seminar in Dairy Science. 1-3 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing or consent of instructor.

Current findings and research problems in the field and their application to industry. Group study of current problems of industry. Current experimental and research findings as applied to production and marketing. Repeatable for up to 3 units. Credit/No Credit grading only. 1-3 seminars. Credit/ no credit grading only.

DSCI 582. Dairy Processing and Plant Management. 2 units

Term Typically Offered: W

Prerequisite: Admission to Master of Professional Studies program in Dairy Products Technology.

Dairy plant operation, processing experience and production team dynamics. Practical training and experience in dairy plant operations to allow efficient, safe and sanitary processing of dairy products manufacture in a team environment. Total credit limited to 4 units. 2 laboratories.

DSCI 585. Cooperative Education Experience in Dairy Science. 1-6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Advanced study, analysis and part-time work experience in the field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only.

DSCI 599. Thesis in Dairy Science. 1-9 units

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Systematic research of a significant problem in Dairy Science. Thesis will include problem identification, significance, methods, data analysis, and conclusion. Students must enroll every quarter in which facilities are used or advisement is received. Degree credit limited to 6 units.

DANC Courses**DANC 130. Pilates and Conditioning Fundamentals. 2 units**

Term Typically Offered: F, SP

Introduction to Joseph Pilates' Physicalmind conditioning method. Development of ideal physical fitness for the attainment and maintenance of a uniformly developed body and sound mind. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 131. Beginning Ballet. 2 units

Term Typically Offered: F, W

Fundamentals of ballet technique stressing alignment, turn-out, five basic positions, seven movements of dance, and terminology. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 132. Beginning Modern Dance. 2 units

Term Typically Offered: F, W, SP

Fundamentals of modern technique stressing alignment, off-centered use of torso, floorwork, movement phrases, and improvisation exercises. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 133. Beginning Jazz Dance. 2 units

Term Typically Offered: F, W, SP

Introduction of jazz dance techniques stressing a variety of styles, alignment, isolation, polyrhythms, syncopation, improvisation, and phrasing. Performance technique and presentation of simple dance phrases. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 134. Beginning Ballroom Dance. 2 units

Term Typically Offered: SP

Selected ballroom dances including the cha-cha-cha, foxtrot, merengue, rumba, samba, swing, tango, waltz, and line dance hustle. Emphasis on alignment, etiquette, leading and following, performance techniques, and presentation of simple dance phrases. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 135. International Folk Dance. 2 units

Term Typically Offered: TBD

Introduction to international folk dances including round, longway, and square sets. Study of various dance steps, formation, positions, historical and cultural background. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 210. Active Wellness. 4 units

GE Area D4

Term Typically Offered: SP

Investigation of health and wellness ideologies and techniques for dancers and non-dancers through active participation in fitness circuits and lecture. Elements of fitness, injury prevention, somatic methodologies, anatomy, and body image will be presented and discussed to help students maintain and cultivate optimum health now and in the future. 3 lectures, 1 activity. Fulfills GE D4.

Dance (DANC)

DANC 221. Dance Appreciation. 4 units

GE Area C3

Term Typically Offered: F, SP

Diverse dance forms. Focus on major western dance artists and their works from the 19th century to the present. Cultural context, style and forms in dance. Introductory survey of major experiments in dance. Purchase of concert ticket(s) may be required. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE C3.

DANC 231. Intermediate Ballet. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Intermediate level experience as determined by instructor at first class meeting.

Continuation of training in basic technical skills in ballet stressing phrasing, performance, and more complex step patterns. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 232. Intermediate Modern Dance. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Intermediate level experience as determined by instructor at first class meeting.

Continuing study of DANC 132 with emphasis on various movement styles, phrasing, more complex step patterns, and performance. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 233. Intermediate Jazz Dance. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Intermediate level experience as determined by instructor at first class meeting.

Continuation of DANC 133 with emphasis on more extensive movement vocabulary. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 234. Intermediate Ballroom Dance. 2 units

Term Typically Offered: TBD

Prerequisite: DANC 134 or intermediate level experience as determined by instructor at first class meeting.

Continuation of DANC 134. Selected ballroom dances: cha cha, foxtrot, merengue, rumba, swing, tango, hustle, paso doble, polka and samba. Emphasis on variations, styles, and performance skill. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

DANC 280. Body Awareness and Expression. 4 units

Term Typically Offered: W

Directed group study of movement techniques and exercises to facilitate expressive physical performance. Body effectiveness, alignment and conditioning practice integrated with creative exploration and movement analysis of effort, spatial awareness and detailed body usage. 4 lectures. Crosslisted as DANC/TH 280.

DANC 321. Cultural Influence on Dance in America. 4 units

GE Area C4; USCP

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C3.

Multicultural approach to history of dance in America, with emphasis on American Indian, West African, Caribbean, Mexican, European, and Asian contributions and influences. Explores culture through dance. Purchase of concert ticket(s) required. 4 lectures. Fulfills GE C4 except for Theatre Arts majors. Fulfills USCP.

DANC 331. Advanced Ballet and Repertory. 2 units

Term Typically Offered: F

Prerequisite: DANC 231 or intermediate level experience as determined by instructor at first class meeting.

Advanced ballet technique and reconstruction of historical ballet repertoires from the romantic, classical, neoclassical, and modern periods. Participation in dance performance of selected repertory. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 332. Contemporary Dance Repertory. 2 units

Term Typically Offered: F, SP

Prerequisite: Intermediate level experience as determined by instructor at first class meeting.

Intermediate to advanced dance skills learned through the study and performance of selected contemporary dance repertory. Addresses problems in advanced performance technique. Informal presentation in performance situation. Purchase of concert ticket(s) may be required. Total credit limited to 6 units. 2 activities.

DANC 340. Dance Composition. 4 units

Term Typically Offered: W

Prerequisite: Intermediate level experience as determined by instructor at first class meeting.

Principles of dance composition. Exploration of creative potential and development of movement motifs through choreographic studies. Preparation for informal public presentation of student generated choreographic works. Purchase of concert ticket(s) may be required. Total credit limited to 8 units. 1 lecture, 1 laboratory, 2 activities.

DANC 341. Dance Concert Practicum. 2 units

Term Typically Offered: SP

Prerequisite: consent of instructor.

Advanced practical application of choreography and dance concert production. Production of the student-produced Spring Dance Concert will be developed and executed. Investigation of complete choreographic work via peer and faculty review. Total credit limited to 8 units. 2 laboratories.

DANC 345. Choreography/Workshop in Dance Concert Preparation. 4 units

Term Typically Offered: F

Prerequisite: By audition only.

Workshop in concert preparation for major public dance production. Exploration and process of concert dance choreography. Purchase of concert ticket(s) may be required. Total credit limited to 16 units. 2 activities, 2 laboratories.

DANC 346. Dance Production. 1-4 units

Term Typically Offered: W

Prerequisite: One of the following: DANC 332, DANC 331, or DANC 345.

Directed production of annual Orchesis Dance Company Concert and other public performances. Attendance of professional dance concert(s) required. Purchase of concert ticket(s) may be required. Total credit limited to 16 units. 1-4 laboratories.

DANC 381. Dance Teaching Methods for Dance Minors. 4 units

Term Typically Offered: W

Prerequisite: Dance Minor.

Dance skills and techniques. Experience in selected dance forms. Rhythmic structure and analysis of dance steps. Includes introduction to dance pedagogy, curricular materials and evaluative procedures. Purchase of concert ticket(s) may be required. 2 lectures, 2 activities.

DANC 400. Special Problems. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor and department head.

Individual investigation, research and studies or survey of selected problems in dance and related areas. Total credit limited to 8 units with a maximum of 4 units per quarter.

DANC 430. Advanced Selected Techniques. 2 units

Term Typically Offered: SP

Prerequisite: Consent of instructor.

Directed study of selected topics for advanced dance students. Focus on advanced level technique, style, concepts and choreography of classical and contemporary dance forms. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 2 activities.

DANC 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed study of selected topics for advanced dance students. Class Schedule will list topics selected. Total credit limited to 8 units. 1-4 lectures.

DANC 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for dance students. Class Schedule will list topics selected. Total credit limited to 8 units. 1-4 laboratories.

Data Science (DATA)

DATA Courses

DATA 301. Introduction to Data Science. 4 units

Term Typically Offered: W

Prerequisite: CPE/CSC 202; and STAT 302 or STAT 312.

Introduction to the field of data science and the workflow of a data scientist. Types of data (tabular, textual, sparse, structured, temporal, geospatial), basic data management and manipulation, simple summaries, and visualization. 3 lectures, 1 laboratory.

DATA 401. Data Science. 4 units

Term Typically Offered: F

Prerequisite: CSC 365, CSC 466, DATA 301, STAT 331 and STAT 419.

Principles of data science and big data analytics. Volume, velocity, and variety of data. Acquisition, processing, and cleaning of large data-sets. Analytics for big data. 3 lectures, 1 laboratory.

DATA 451. Data Science Capstone I. 2 units

Term Typically Offered: W

Prerequisite: DATA 401.

Working with clients to develop data-driven solutions for systems to be constructed in DATA 452. Specification and design requirements, elicitation techniques, research and data gathering methods; project planning, time and budget estimating; project team organization. Ethics and professionalism. 2 laboratories.

DATA 452. Data Science Capstone II. 2 units

Term Typically Offered: SP

Prerequisite: DATA 451.

Team-based design, implementation, deployment and delivery of a system or analytical methodology that involves working with and analyzing large quantities of data. Technical management of research and development teams. Technical documentation, quality assurance, integration and systems testing. Design and conduct of empirical studies. Visualization and presentation of results orally and in writing. 2 laboratories.

Early Start English (ESE)

ESE Courses

ESE 90. Early Start Program: English. 1.5 units

Term Typically Offered: SU

Prerequisite: Appropriate score on EPT.

Review of fundamental writing and rhetoric skills intended for students who need to meet the CSU Early Start Program (ESP) requirement. Not for baccalaureate credit. Credit/No Credit grading only. Formerly ESE 100.

Early Start Math (ESM)

ESM Courses

ESM 90. Early Start Program: Mathematics. 1.5 units

Term Typically Offered: SU

Prerequisite: Appropriate score on the ELM examination or appropriate Math Placement Level.

Review of basic algebra skills intended for students who need to meet the CSU Early Start Program (ESP) requirement. Not for baccalaureate credit. Credit/No Credit grading only. Formerly ESM 100.

Earth Science (ERSC)

ERSC Courses

ERSC 140. Careers in Natural Resources Management and Environmental Sciences. 1 unit

CR/NC

Term Typically Offered: F

Analysis and development of career goals in natural resources and environmental sciences. Acquainting students with potential career options and preparation of academic plans for the majors in the Natural Resources Management and Environmental Sciences Department. Credit/No Credit grading. 1 activity. Crosslisted as ERSC/NR 140.

ERSC 144. Introduction to Earth Science. 4 units

Term Typically Offered: F

Survey of fundamental processes of Earth science. Application of systems thinking to understanding the dynamic interactions among geological, geographic, soils and human factors in shaping the Earth. 3 lectures, 1 activity.

ERSC 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 12 units, with a maximum of 2 units per quarter. Crosslisted as ERSC/SS 200.

ERSC 223. Rocks and Minerals. 4 units

Term Typically Offered: W

Prerequisite: SS 121, CHEM 111 or CHEM 127.

Origin, composition, identification and weathering of rocks, minerals, and clays important in the development of soils. Parent materials as related to the nature and properties of soils. 3 lectures, 1 laboratory.

ERSC 250. Physical Geography. 4 units

Term Typically Offered: F, W

Addresses the origins and patterns of the earth's diverse assemblage of climates, landforms, biota and soils. A major focus on relationship between human cultures and these earthly environments. 4 lectures. Crosslisted as ERSC/GEOG 250.

ERSC 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 lectures. Crosslisted as ERSC/SS 270.

ERSC 301. Earth Sciences/Soils Science Practicum. 1-2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: SS 110 or SS 121.

Supervised practice in technical, educational, professional, and operational applications related to earth sciences or soil science. Students participate in faculty-supervised group or individual activities that support educational and professional goals. Credit/No Credit grading only. Total credit limited to 12 units. 1-2 activities. Crosslisted as ERSC/SS 301.

ERSC 303. Soil Erosion and Water Conservation. 4 units

Term Typically Offered: F

Prerequisite: LA/NR 218 or GEOG 318; and SS 121. Replaces ERSC 202.

Evaluation of soil and water conservation and best management practices for agriculture, urban, riparian, and rangelands. Study of process and control of soil erosion, water quality, and stormwater. Development of an erosion and sediment control plan or farm water quality plan to meet regulatory requirements. 3 lectures, 1 activity.

ERSC 323. Geomorphology. 4 units

Term Typically Offered: F, SP

Prerequisite: SS 121 and GEOL 201.

Recognizing and identifying major landforms and their components by interpretation of aerial photographs and topographic maps, and observations. Emphasis on analyzing common landforms in the western United States for application in soil science, physical geography, hydrology, and geology. 2 lectures, 1 laboratory, 1 activity.

ERSC 325. Climate and Humanity. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Geographic perspective on the interrelationships between climate and human cultures. Effects of people on climate and the influence of climate and weather upon human activities and behavior. Focus on global human conditions which are responsible for the alteration of climate and in turn are vulnerable to climate change. 4 lectures. Crosslisted as ERSC/GEOG 325.

ERSC 333. Human Impact on the Earth. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Global assessment of the impact of humans on the earth's vegetation, animals, soil, water and atmosphere. Emphasis on problems stemming from the interactions of human attitudes, technologies, and population with natural resources. 4 lectures. Crosslisted as ERSC/GEOG 333.

ERSC 335. Soil, Water, and Civilization. 4 units

GE Area F

Term Typically Offered: W, SU

Prerequisite: Junior standing and completion of GE Area B.

Explore past civilizations and how management of soil, water, and other natural resources allowed them to flourish, decline, or fail. Sustainability of natural resource use in modern/future societies. Issues include sustainability, agricultural practices, deforestation, water quality, and land management. 4 lectures. Fulfills GE Area F.

ERSC 339. Internship in Environmental Earth and Soil Sciences. 1-12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of internship instructor.

Selected students will spend up to 12 weeks with an approved firm or agency engaged in work and study related to their major. A detailed written proposal and written interim and final reports required. One unit of credit may be allowed for each full week of internship. Credit/No Credit grading. Crosslisted as ERSC/SS 339.

ERSC 363. Undergraduate Seminar. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing.

Review of current research, experiments, and problems related to the student's major field of interest. Presentation of reports on problems or research activities in preparation for the senior project. Introduction to professional practices within a student's major field of interest. 2 seminars.

ERSC 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 12 units. Crosslisted as ERSC/SS 400.

ERSC 401. Field-Geology Methods. 4 units

Term Typically Offered: W

Prerequisite: GEOL 102 or GEOL 201, GEOL 241, GEOL 415, ERSC 223, ERSC 323.

Collecting and interpreting field-geologic data. Description of sedimentary rocks and construction of stratigraphic columns. Mapping geologic structures in the field. Surficial geologic stratigraphy and surficial geologic mapping. Understanding geologic processes through field study. Communicating results of field study. 1 lecture, 3 activities. Crosslisted as ERSC/GEOL 401.

ERSC 402. Geologic Mapping. 4 units

Term Typically Offered: SP

Prerequisite: ERSC/GEOL 401.

Bedrock geologic mapping on topographic maps and aerial photos. Surficial geologic mapping on topographic maps and aerial photos. Correlating and defining surficial geologic map units on the basis of soil development. Understanding landscape evolution using soil development 4 activities. Crosslisted as ERSC/GEOL 402.

ERSC 414. Global and Regional Climatology. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

The earth's pattern of climates and the physical processes that account for them. Focus on interrelationships between climate and the physical/biological and cultural environments. Special emphasis on modern climate changes and their consequences. 3 lectures, 1 laboratory. Crosslisted as ERSC/GEOG 414.

ERSC 415. Applied Meteorology and Climatology. 4 units

Term Typically Offered: TBD

Prerequisite: ERSC/GEOG 250.

Physical processes in the atmosphere that determine regional weather, climate and climate variability. Surface and satellite systems for weather observation, and weather/climate modeling. Dynamics of weather systems, including thunderstorms and hurricanes. Emphases on weather/climate affecting agriculture and other human activities. 3 lectures, 1 activity. Crosslisted as ERSC/GEOG 415.

ERSC 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 lectures. Crosslisted as ERSC/SS 470.

ERSC 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Crosslisted as ERSC/SS 471.

ERSC 476. Senior Project - Advanced Internship Experience in Environmental Science/Management. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Completion of GE Area A with a grade of C- or better; and ERSC 363 or NR 306 or NR 326.

Independent internship experience conducted under faculty supervision focusing on a discipline area of environmental science/management. Completion of a project as a component of their internship. Satisfies the senior project requirement. Minimum 90 hours required. Crosslisted as ERSC/NR 476.

ERSC 477. Senior Project - Research Experience in Environmental Science. 3 units

Term Typically Offered: W

Prerequisite: Completion of GE Area A with a grade of C- or better; and ERSC 363 or NR 306 or NR 326.

Guided research experience in a specific area of environmental science. Implementation of materials and methods. Collection, analysis and interpretation of data. Completion of formal written report. Satisfies senior project requirement. 1 lecture, 2 laboratories. Crosslisted as ERSC/NR 477.

ERSC 478. Senior Project - Current Topics in Environmental Science/Management. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better; and ERSC 363 or NR 306 or NR 326.

Critical evaluation and formal presentation of current issues in environmental science/management. Evaluation of current topics, analysis of supporting evidence, and synthesis and presentation of resulting perspectives on different approaches to current challenges in environmental science/management. Satisfies the senior project requirement. 3 lectures. Crosslisted as ERSC/NR 478.

ERSC 479. Senior Project - Independent Study. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better; ERSC 363 or NR 306 or NR 326; and consent of instructor.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 90 hours total time. Crosslisted as ERSC/NR 479.

ERSC 544. Earth Sciences for Educators. 3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

An interdisciplinary earth sciences course which emphasizes the interactions of multiple systems of air, water, land, life, and human society. Designed for teachers and students seeking teaching credential. Incorporates scientific theory, learning resources, and applications in the field. 3 lectures. Not open to students in Soil Science specialization under MS Agriculture.

ERSC 570. Selected Topics in Earth Science. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 1 to 4 seminars.

ERSC 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

Economics (ECON)

ECON Courses

ECON 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ECON 201. Survey of Economics. 4 units

GE Area D2

Term Typically Offered: F,W,SP,SU

Basic principles of microeconomics and macroeconomics. Emphasis on applications to current national and global economic issues. For majors requiring one quarter of economics. Not open to students having previous credit in ECON 222 or equivalent. 4 lectures. Crosslisted as ECON/HNRS 201. Fulfills GE D2.

ECON 221. Microeconomics. 4 units

Term Typically Offered: F, W, SP

Microeconomic principles. Marginal and equilibrium analysis of commodity and factor markets in determination of price and output. Normative issues of efficiency and equity. 4 lectures.

ECON 222. Macroeconomics. 4 units

GE Area D2

Term Typically Offered: F,W,SP,SU

Introduction to economic problems. Macroeconomic analysis and principles. Aggregate output, employment, prices, and economic policies for changing these variables. International trade and finance. Issues of economic growth and development. Comparative economic systems and economies in transition. 4 lectures. Fulfills GE D2.

ECON 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ECON 303. Economics of Poverty, Discrimination and Immigration. 4 units

GE Area D5; USCP

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and ECON 201 or ECON 222.

Economic analysis of the cause, extent and impact of poverty, discrimination and immigration and of the policies designed to address these socioeconomic issues. Emphasis on the experience of African-Americans, Latinos, and women in the United States. 4 lectures. Crosslisted as ECON/HNRS 303. Fulfills GE D5 except for Economics majors. Fulfills USCP.

ECON 304. Comparative Economic Systems. 4 units

GE Area D5

Term Typically Offered: F

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and ECON 201 or ECON 222.

Analysis of economic systems as a set of mechanisms and institutions for decision making, and the implementation of decisions regarding income distribution, the levels of consumption and production, and the level of economic welfare. 4 lectures. Fulfills GE D5 except for Economics majors.

ECON 311. Intermediate Microeconomics I. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ECON 201; or ECON 221 and ECON 222; and MATH 141 or MATH 221.

Consumer behavior and the theory of demand; production, cost, supply functions; perfect competition; monopoly and oligopoly; labor markets. 4 lectures.

ECON 312. Intermediate Microeconomics II. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ECON 311.

Game theory; risk, uncertainty and information; choice over time; asset markets; general equilibrium; welfare economics, externalities and public goods. 4 lectures.

ECON 313. Intermediate Macroeconomics. 4 units

Term Typically Offered: F, W, SP

Corequisite: ECON 311.

Analysis of national income, price level, employment, international trade and economic growth. Development of the theory of national income determination. Evaluation of roles of monetary and fiscal policy. 4 lectures.

ECON 325. Economics of Development and Growth. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A with a grade of C- or better; completion of GE Area D3; and either ECON 221 and ECON 222, or ECON 201.

Analysis of the economy of less developed countries, and a survey of public policies designed to stimulate economic growth and reduce poverty. Topics include financing development, technology, population problems, human capital, rural and urban development, trade policy and the economic relationships between developed and developing nations. 4 lectures.

ECON 330. International Trade Theory. 4 units

Term Typically Offered: W

Prerequisite: Either ECON 221 and ECON 222, or ECON 201.

Theory of comparative advantage, gains from trade, and recent developments in trade theory; examination of tariffs, quotas, exchange controls, other trade barriers and underlying policy issues; review of U.S. commercial policy, GATT, the common market, regional and world economic organizations. 4 lectures. Not open to students with credit in ECON 404 or equivalent.

ECON 337. Money, Banking and Credit. 4 units

Term Typically Offered: F, W

Prerequisite: Either ECON 221 and ECON 222, or ECON 201.

Financial markets and institutions. Structure of the banking industry and impacts of technological change in banking. Structure and operations of the Federal Reserve. Impacts of monetary policy on the economy. 4 lectures.

ECON 339. Econometrics. 4 units

Term Typically Offered: F, W, SP

Prerequisite: either ECON 221 and ECON 222; or ECON 201; MATH 141 or MATH 221, and STAT 252 or STAT 302.

Application of statistical methods useful in economics. General linear regression model. Specific issues and problems related to economic models: multicollinearity, autocorrelation, heteroscedasticity, dummy variables, lagged variables, and simultaneous equation estimation. Application and evaluation of selected examples of empirical economic research. Microcomputer applications. 3 lectures, 1 activity.

ECON 345. Environmental and Natural Resource Economics. 4 units

Term Typically Offered: F, SP

Prerequisite: ECON 201; or ECON 221 and ECON 222.

Economics of environmental resource management. Conservation, sustainability, and dynamic efficiency in natural resources. Effects of property rights and economic incentives on environmental and economic systems. Design of local and global environmental policies to align market outcomes with social welfare goals. 4 lectures. Not open to students with credit in ECON 431, ECON 432 or equivalent.

ECON 395. Programming for Economics and Analytics. 4 units

Term Typically Offered: W, SP

Prerequisite: Junior standing; STAT 252 or STAT 302.

Basic principles of algorithmic problem solving and computer programming for economics and business analytics applications. Functions, iteration, recursion, and data structures. Testing and debugging. Design of algorithms and algorithmic complexity. Stochastic programs. Graph optimization. Credit will only be granted in one of the following courses: CSC 108, CSC 202, ECON 395. 3 lectures, 1 laboratory.

ECON 400. Special Problems. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units.

ECON 403. Industrial Organization. 4 units

Term Typically Offered: SP

Prerequisite: ECON 312.

Application of basic tools of economics to American Industry. Case studies of individual firms and industries. Performance of various business structures, such as monopoly and oligopoly. Effects of government regulation and antitrust policy. 4 lectures.

ECON 404. International Trade Theory. 4 units

Term Typically Offered: W

Prerequisite: ECON 312.

Theory of comparative advantage, neoclassical model of trade, offer curves and terms of trade, edgeworth boxes, valuation of factor inputs, effects of migration and mobility of funds, emerging growth and trade distortions, welfare effects of trade, and recent developments in trade theory. 4 lectures.

ECON 405. International Monetary Economics. 4 units

Term Typically Offered: W

Prerequisite: ECON 313.

Nature of international payments, U.S. balance of payments. Theory and practice of foreign exchange rate determination under the gold standard, paper standard, and IMF system; international money and capital markets; problems of international liquidity and monetary stability. 4 lectures.

ECON 406. Applied Forecasting. 4 units

Term Typically Offered: TBD

Prerequisite: ECON 311 and ECON 339.

Causes and measurement of business fluctuations. Techniques of forecasting with microcomputer applications. 3 lectures, 1 activity.

ECON 408. Mathematical Economics. 4 units

Term Typically Offered: W

Prerequisite: ECON 312.

Applications of quantitative techniques to topics in microeconomic and macroeconomic theory. Use of multivariate calculus and linear algebra in formulating static economic models. Applications of statistical inference, estimation and forecasting in economic models. 4 lectures.

ECON 409. Probability Models for Economic Decisions. 4 units

Term Typically Offered: F

Prerequisite: ECON 312.

Decision making in complex, realistic situations. Simulation of random variables in Excel. Risk aversion. Subjective assessment of probabilities and correlations. Decision trees. Optimal bidding in auctions. The winner's curse. Moral hazard and risk sharing. Repeated investment decisions under risk. 4 lectures.

ECON 410. Public Finance and Cost-Benefit Analysis. 4 units

Term Typically Offered: F

Prerequisite: ECON 312 or graduate standing.

Principles of rational decision making with respect to government revenues and spending. Measurement of costs and benefits, and criterion selection. Taxation, user fees, deficit financing, public goods, neighborhood effects and zoning. Microcomputer applications. 4 lectures.

ECON 413. Labor Economics. 4 units

Term Typically Offered: F

Prerequisite: ECON 312.

Wage determination theory, basic economic factors that affect the labor movement, economic impact of union activities on employment, output, income, wages, prices, and national economic policy. 4 lectures.

ECON 417. Development of Economic Analysis. 4 units

Term Typically Offered: TBD

Prerequisite: ECON 311.

Analysis of ideas related to the development of economic theory in the Western civilization from the Greeks through the classical, neoclassical, and Keynesian to the current post-Keynesian concepts. 4 lectures.

ECON 424. Monetary Economics. 4 units

Term Typically Offered: TBD

Prerequisite: ECON 313.

The role of money in our economy. Focus on the links between monetary policy, interest rates, prices, housing markets, mortgage lending and overall economic activity. Public policy issues relating to real estate markets. 4 lectures.

ECON 431. Environmental Economics. 4 units

Term Typically Offered: F

Prerequisite: ECON 312.

Economic dimensions of environmental abuse and protection. Use of simple economic models in developing and evaluating environmental policies. Overview of current environmental problems. Issues related to the sustainability of economic growth at the national and international levels. 4 lectures.

ECON 432. Economics of Energy and Resources. 4 units

Term Typically Offered: SP

Prerequisite: ECON 312 or graduate standing.

Economic theory and public policies as applied to problems of natural resources and energy. Dynamic resource and energy models developed with reference to public and private sector growth. Application of the principles of capital theory emphasized. Case studies. Computer software applications in the study of natural resources and energy under uncertainty. 4 lectures.

ECON 434. Urban Economics. 4 units

Term Typically Offered: SP

Prerequisite: ECON 311. Recommended: ECON 312.

Application of basic tools of economic analysis to problems of urban regions. Causes and possible cures for inadequate growth rate, income levels, and the quality of life in urban regions. 4 lectures.

ECON 435. Economics of Land and Water. 4 units

Term Typically Offered: TBD

Prerequisite: ECON 312 or graduate standing.

Economic analysis of natural resource issues, policies and management with an emphasis on land and water use decisions in the western U.S. Urban demand for water; water supply and economic growth; economic impacts of surface water law and institutions; economics of land management. 4 lectures.

ECON 440. Advanced Econometrics. 4 units

Term Typically Offered: W

Prerequisite: ECON 339.

Modern advanced econometric techniques with a special focus on those commonly used in academic and non-academic settings. Discrete dependent variable models, instrumental variables, causal inference, nonlinear estimation, panel data, seemingly unrelated regression, distributed lag models, cointegration, and error correction models. 3 lectures, 1 activity.

ECON 460. Research Methodology in Applied Economics. 4 units

Term Typically Offered: W, SP

Prerequisite: ECON 313; ECON 339 and Senior standing.

Theory and practice of the development of economic analysis. Steps in the formulation and execution of an economics research project. 4 lectures.

ECON 461. Senior Project I. 2 units

Term Typically Offered: TBD

Prerequisite: ECON 313 and senior standing.

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

ECON 462. Senior Project II. 2 units

Term Typically Offered: TBD

Prerequisite: ECON 313 and senior standing.

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

ECON 464. Applied Senior Project. 4 units

Term Typically Offered: F, SP

Prerequisite: Senior standing and two 400-level ECON courses other than ECON 460. Corequisite: ECON 460.

Analysis of selected economic topics and problems in directed individual or group-based projects, which require application of economic models, principles and theory to investigate important business, economic or social issues. Formal report required. 4 seminars.

ECON 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

Education (EDUC)

EDUC Courses

EDUC 125. First Year Seminar. 2 units

CR/NC

Term Typically Offered: TBD

Issues associated with the successful transition from high school or community college to Cal Poly. Links fostered between student needs and campus resources. Coverage of academic policies and procedures, university study skills, goal setting, career planning, wellness and other topics relevant to student success. Not open to students with credit in UNIV 100. Credit/No Credit grading only. 1 lecture, 1 activity. Crosslisted as EDUC/UNIV 125.

EDUC 207. Children's Learning and Development in Educational Settings. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing; PSY 201 or PSY 202 or admission to the university with the intent to enter the MSTEP Program.

Study of theories and research about the development and learning of children and young adolescents within diverse backgrounds, and application to teaching in public school settings. Observations/interactions with children in school settings. 3 lectures, 1 activity. Participation in public schools requires mandated fingerprint clearance. Crosslisted as CD/EDUC 207.

EDUC 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

EDUC 300. Historical, Philosophical, and Social Foundations of Public Education. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing.

Historical, philosophical, and social foundations of public education in relation to school curriculum, instruction and dispositions of effective teachers. Structured observation and participation in K-12 public schools with attention to instructional practices for diverse learners. 2 lectures, 1 activity. Participation in public schools requires mandated fingerprint clearance.

EDUC 400. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: Junior standing and consent of instructor.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

EDUC 401. Field Experience Seminar. 3 units

CR/NC

Term Typically Offered: F

Prerequisite: admission to the single subject credential program.

Discussion of contemporary educational issues, classroom practice, and professional dispositions; reflection on beginning fieldwork experiences in the classroom and their connection with educational theory and research. Credit/ No Credit grading only. 3 seminars.

EDUC 405. Social, Historical and Cultural Influences on Latino/a Students in Education. 4 units

Term Typically Offered: SP

Prerequisite: SPAN 202 with a grade of B or better, or appropriate score on placement exam, or consent of instructor.

Social, cultural, historical, political, economic, and educational factors and systems in Latin America and the United States that have contributed to and shaped Latino/a individual and group identity. How factors affect individual acculturation in California and the United States and influence how Latino/as experience and participate with schooling in the United States. 3 seminars, 1 activity.

EDUC 410. Social, Historical and Ethical Perspectives on Teaching and Learning. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Admission to the Single Subject Credential Program.

Inquiry into the social, historical, philosophical and psychological foundations of education with an emphasis on applying educational theory to practice. Prepares Single Subject Credential Program students for classroom teaching. 4 lectures.

EDUC 412. Access to Learning in a Pluralistic Society. 4 units

Term Typically Offered: F, SP

Prerequisite: Admission to the Single Subject Credential Program.

The role of culture, status, identity, and human development in public school experiences of diverse learners. Organization and management of secondary school classrooms as related to adolescent development and issues of access to learning. 4 lectures.

EDUC 414. Curriculum and Inquiry in Public Schools. 4 units

Term Typically Offered: F, SP

Prerequisite: Admission to the Single Subject Credential Program.

Principles, methods and practices of organizing curriculum, instruction, and assessment for secondary school subject areas, with an emphasis on backward design in curriculum development and assessment. Site visits to local schools to allow analysis of planning, instruction, and assessment in secondary school classrooms. 4 lectures.

EDUC 416. Literacy, Language, and Culture in Content Area Classrooms. 3 units

Term Typically Offered: F, W

Prerequisite: Admission to the Single Subject Credential Program.

Theories and application of literacy learning, assessment and second language acquisition in content classrooms. Observation of classrooms, tutoring English language learners, designing and teaching literacy lessons, planning and implementing assessments across content areas. Recognition of the role of culture in language acquisition. Course may be offered in classroom-based or online format. 3 lectures.

EDUC 417. Literacy, Language, and Culture in the Content Area Classroom Fieldwork. 1 unit

CR/NC

Term Typically Offered: F, W

Fieldwork in the secondary classroom related to literacy, language and culture for Agriculture Education candidates. Includes 1-3 hours of observation each week. Participation in public schools requires mandated fingerprint clearance. Credit/No Credit grading. 1 activity.

EDUC 418. Culturally Responsive Teaching in Diverse Classrooms. 3 units

Term Typically Offered: F, SP

Prerequisite: Admission to the Single Subject Credential Program.

Differentiated instruction and further theoretical knowledge and skills needed for successful teaching of linguistically and culturally diverse learners, as well as students with special learning needs. PACT assessments embedded in course prepare credential candidates for the teaching event. 3 lectures.

EDUC 419. Culturally Responsive Fieldwork in Diverse Classrooms. 1 unit

CR/NC

Term Typically Offered: F, SP

Fieldwork in the secondary classroom related culturally responsive teaching in diverse classrooms for Agriculture Education candidates. Includes 1-3 hours of observation each week. Participation in public schools requires mandated fingerprint clearance. Credit/No Credit grading. 1 activity.

EDUC 423. Bilingual Literacy. 4 units

Term Typically Offered: W

Prerequisite: Admission to the Spanish Authorization for Bilingual Educators (SABE) Program.

Patterns of classroom organization, application of reading programs, approaches, methods in English and Spanish, and supervised field experiences in elementary classrooms with bilingual students. 3 seminars, 1 activity.

EDUC 427. Theories, Methods, and Assessment of First and Second Language Acquisition in Schools. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing. Recommended: ENGL 391.

Theories, methods, materials and assessment involved in the instruction of emergent bilingual students. Bilingual, transitional, and English only programs compared across a historical framework. Emphasis on an integrated language arts approach; theories of language acquisition. 3 seminars, 1 activity. Participation in public schools requires mandated fingerprint clearance.

EDUC 428. Foundations of K-8 Literacy Teaching and Learning in Schools with Diverse Populations. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Senior or Graduate standing.

Introduction of foundational topics in literacy teaching and learning in K-8 schools with diverse populations. Examination of concepts and theories underlying literacy learning and instruction, and relating research-based patterns of reading and writing development to features of the learner and learning environments. Participation in public schools requires mandated fingerprint clearance. 3 seminars, 1 activity.

EDUC 429. Learning to Teach K-8 Literacy in Schools with Diverse Populations. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Admission to the Multiple Subject Teacher Preparation Program.

Integration of theory and practice for planning, instruction and assessment in a balanced, comprehensive, research-based K-8 literacy and language arts program to enable children of all abilities and background to read, write, speak, listen and think effectively. 4 seminars.

EDUC 431. Learning to Teach K-8 Social Studies with Diverse Populations. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Admission to the Multiple Subject Teacher Preparation Program.

Curriculum instruction and assessment concepts regarding teaching social studies to culturally diverse students in grades K-8, to promote civic competence and the development of elementary students' knowledge and reasoning in the social sciences. 4 seminars.

EDUC 433. Foundations of Bilingual Education. 4 units

Term Typically Offered: F

Prerequisite: Admission to the Spanish Authorization for Bilingual Educators (SABE) Program.

History, theories, and practices associated with contemporary bilingual education in California and the U.S. Observation and limited teaching in bilingual classrooms. Approximately one-half of the class taught in Spanish. 3 seminars, 1 activity.

EDUC 435. Learning to Teach K-8 Mathematics with Diverse Populations. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Admission to the Multiple Subject Teacher Preparation Program.

Curriculum, instruction, and assessment concepts regarding teaching mathematics for understanding to culturally diverse students in grades K-8, with emphasis on using manipulatives to promote elementary students' development of mathematical knowledge and reasoning. 4 seminars.

EDUC 436. Learning to Teach K-8 Science with Diverse Populations. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Admission to the Multiple Subject Teacher Preparation Program.

Curriculum, instruction, and assessment concepts regarding teaching science for understanding to culturally diverse students in grades K-8, with emphasis on teaching via inquiry to promote the development of scientific knowledge and reasoning. 3 seminars, 1 activity.

EDUC 438. Multiple Subject Clinical Practice I. 2-4 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Admission to the Multiple Subject Teacher Preparation (MSTEP) Program.

Clinical experiences involving observation; limited lesson planning, instruction, assessment and reflection; growth as a professional educator and participation in school-related activities in K-8 public school classrooms. Participation in public schools requires mandated fingerprint clearance. Total credit limited to 4 units. Credit/No Credit grading only.

EDUC 439. Multiple Subject Clinical Practice Seminar I. 2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Admission to the Multiple Subject Teacher Preparation (MSTEP) Program.

Discussion of contemporary educational issues and classroom practice; reflection on beginning clinical experiences in elementary education and their connection with educational theory and research. Total credit limited to 4 units. Credit/No Credit grading only. 2 seminars.

EDUC 440. Educating Individuals with Exceptional Needs. 4 units

Term Typically Offered: F, W, SP

Prerequisite: EDUC 429, EDUC 431, EDUC 435, EDUC 436, EDUC 438 and EDUC 439.

Characteristics, incidence, and etiology of individuals with exceptional needs. Problems, assessment, and approaches toward accommodating students with exceptional needs in the regular classroom. 3 seminars, 1 activity.

EDUC 442. Elementary Field Experience in General and/or Special Education. 1-4 units

CR/NC

Term Typically Offered: F

Prerequisite: Acceptance into the Preliminary Special Education Credential Program or the Multiple Subject Teacher Preparation (MSTEP) Program.

Public school classroom experiences in general education and/or special education classrooms at the elementary level. Teaching individuals and small groups. Total credit limited to 4 units. Credit/No Credit grading only.

EDUC 447. Secondary Field Experience in General and/or Special Education. 1-4 units

CR/NC

Term Typically Offered: F

Prerequisite: Acceptance into the Preliminary Special Education Credential Program or the Single Subject Credential Program.

Public school classroom experiences in general education classrooms and/or special education classrooms at the secondary level. Teaching individuals and small groups. Total credit limited to 4 units. Credit/No Credit grading only.

EDUC 449. Special Education Student Teaching. 8 units

CR/NC

Term Typically Offered: SP

Prerequisite: Acceptance into Level I Special Education Credential Program, and completion of all program requirements. Concurrent: EDUC 451.

Participation in public schools as a student teacher in activities representing different roles of special education teachers. Assumption of a teacher's responsibility for individual and small groups. Minimum 4 days per week. Credit/No Credit grading only.

EDUC 450. Teaching Performance Assessment Seminar. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Tasks, timelines, evaluation rubrics, and academic writing in relation to the Teaching Performance Assessments that are required for teacher credentialing in California. Total credit limited to 2 units. Credit/No Credit grading. 1 seminar.

EDUC 451. Special Education Student Teaching Seminar. 4 units

CR/NC

Term Typically Offered: SP

Prerequisite: Acceptance into Level I Special Education Credential Program; completion of program requirements for the Level I Special Education Program. Concurrent: EDUC 449.

Educational issues and research, development and assessment of teaching portfolio, completion of materials for a job search, and beginning the first year as a special educator. 3 seminars, 1 activity.

EDUC 454. Multiple Subject Clinical Practice II. 6 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Admission to the Multiple Subject Teacher Preparation (MSTEP) Program.

Clinical experiences involving planning, instruction, assessment and reflection; growth as a professional and related activities in K-8 public school classrooms. Participation in public schools requires mandated fingerprint clearance. Credit/No Credit grading only.

EDUC 455. Multiple Subject Clinical Practice Seminar II. 3 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Acceptance into STEP II or STEP B of the Multiple Subject Teacher Preparation Program. Concurrent: EDUC 454.

Discussion of contemporary educational issues, state education policies and expectations for effective classroom practice; reflection on clinical experiences in elementary education and their connection with educational theory research. Participation in public schools requires mandated fingerprint clearance. Credit/No Credit grading. 3 seminars.

EDUC 456. Multiple Subject Clinical Practice III. 12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: EDUC 454 and EDUC 455. Concurrent: EDUC 457.

Advanced clinical experiences involving planning, instruction, assessment and reflection; growth as a professional and related activities in K-8 public school classrooms. Credit/No Credit grading only.

EDUC 457. Multiple Subject Clinical Practice Seminar III. 3 units
CR/NC

Term Typically Offered: F, W, SP

Prerequisite: EDUC 454 and EDUC 455. Concurrent: EDUC 456.

Discussion of contemporary educational issues, national education policies and expectations for effective classroom practice; reflection on advanced clinical experiences in elementary education and their connection with educational theory and research. Credit/No Credit grading. 3 seminars.

EDUC 460. Clinical Practice I. 4 units
CR/NC

Term Typically Offered: F

Prerequisite: Admission to the Single Subject Credential Program.

Clinical experiences involving observation; limited planning, instruction, assessment and reflection; growth as a professional, and participation in other school-related activities in secondary public classrooms. Credit/No Credit grading only.

EDUC 469. Clinical Practice II. 8 units
CR/NC

Term Typically Offered: W

Prerequisite: Completion of courses and requirements to begin student teaching and approval of campus screening committee for credential candidates.

Part-time assignment in a classroom (Single Subject only). Includes teaching activities under the direction of a selected cooperating teacher in consultation with a university supervisor. Assignment consists of an entire morning in the classroom (or the equivalent) for one quarter. Credit/No Credit grading only.

EDUC 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

EDUC 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

EDUC 479. Clinical Practice III. 12 units
CR/NC

Term Typically Offered: SP

Prerequisite: Completion of all courses and requirements prerequisite to full-time student teaching and approval by campus screening committee for credential candidates.

Full-time assignment in a classroom (Single Subject only). Includes teaching activities under the direction of a selected cooperating teacher in consultation with a university supervisor. Assignment consists of an entire teaching day in the school for one quarter. Credit/No Credit grading only.

EDUC 480. Computer Based Curriculum. 2 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Computer assisted instruction and computer based technology. Lesson planning and integration of technology into the K-12 curriculum. Familiarization with available educational courseware and software. Emphasis on classroom application. 1 seminar, 1 activity.

EDUC 500. Individual Study. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of department head, graduate major advisor, and supervising faculty member.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Total credit limited to 8 units.

EDUC 502. Advancing Pedagogical Practices with Technology. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing.

Examination of technology-supported instruction with special focus on the use of technology to enable constructivist learning experiences for K-12 students. A survey of advanced technologies including Web-based tools, apps, digital story telling, and media production. Course offered online only. 3 seminars, 1 activity.

EDUC 510. Education Finance and Resource Allocation. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing and consent of instructor.

Financing public schools in America: historical and current sources and types of funding. District level and site level funding and budgeting including priorities and purchasing procedures. Financial implications of personnel contracts and obligations. 3 seminars, 1 activity.

EDUC 511. Educational Law and Governance. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing and consent of instructor.

Legal aspects of school administration including unions, collective bargaining, and contract administration. Governing roles of federal, state, and local agencies including boards and district administrators. 3 seminars, 1 activity.

EDUC 512. Education Organization and Management. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing and consent of instructor.

Principles of organization, management, and leadership and their relationship to educational effectiveness and productivity. Activity experience in the application of management theory in schools. 3 seminars, 1 activity.

EDUC 513. Education Planning and Decision Making. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing and consent of instructor.

Concepts of planning and decision making in educational administration that utilize a wide range of data gathering and analysis procedures. 3 seminars, 1 activity.

EDUC 515. Educational Program Management and Evaluation. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing and consent of instructor.

Supervision, management, and evaluation of educational curriculum and educational programs. Current trends in program management including mapping, monitoring, alignment. 3 seminars, 1 activity.

EDUC 516. Educational Personnel Supervision and Evaluation. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing and consent of instructor.

Principles and processes for the supervision and evaluation of certificated and classified staff including legal, research, and professional considerations. 3 seminars, 1 activity.

EDUC 518. Administrative Services Fieldwork. 3 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Admittance to the Administrative Services Credential program and consent of instructor.

Supervised fieldwork in school administration for supervision at the elementary and secondary level. Assignments must encompass three of the four academic quarters and must involve some multicultural experience. Total credit limited to 18 units, only 9 of which may be applied toward master's degree. Credit/No Credit grading only.

EDUC 519. Professional e-Portfolios for Educational Leaders. 1 unit

CR/NC

Term Typically Offered: SP

Prerequisite: Enrollment in the Educational Leadership and Administration Program (ELAP).

Demonstration of exemplars of professional practice keyed to standards for the California Preliminary Administrative Services Credential. Class meets two (2) times per quarter. Faculty meet individually with students as to address portfolio development on a case-by-case basis. Credit/No Credit grading only. 1 activity.

EDUC 521. Literacy Across the Curriculum. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing.

Supporting students' literacy development across school subjects – English language arts, mathematics, science, social studies – through an integrated instructional approach focusing on critical literacy as meaning-making, accommodating diverse students including English language learners and students with special needs. 4 seminars.

EDUC 522. Advanced Classroom Pedagogy. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing.

Principles of authentic pedagogy and development of a classroom learning community. Examination of the role of classroom culture and advanced instructional strategies to foster conceptual development and disciplinary ways of knowing in diverse classrooms. 4 seminars.

EDUC 523. Integrative Approaches to Curriculum. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing.

Perspectives, principles and practices for designing curriculum to foster authentic instruction using integrative approaches. Emphasis on designing for the development of multiple literacies. 3 seminars, 1 activity.

EDUC 528. Advanced Classroom Pedagogy in English Language Arts. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing.

The relationship between theory, research and practice in English Language Arts. Emphasis is on reading processes and principles and advanced teaching practices for the English Language Arts with attention to working with diverse students including English language learners and students with special needs. 4 seminars.

EDUC 532. Advanced Field Experiences in Education. 2-6 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing, completion of a basic teaching or administrative credential.

Advanced field experience and practical application of specialization emphasis for general and special education teachers, school administrators and school support personnel. Total credit limited to 12 units for specialist credentials. Total credit limited to 6 units for the master's degree. Credit/No Credit grading only.

EDUC 535. Advanced Classroom Pedagogy in Elementary Mathematics Education. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing.

Standards-based principles and advanced pedagogical practices for elementary mathematics instruction in diverse classroom settings. 4 seminars.

EDUC 536. Advanced Classroom Pedagogy in Elementary Science Education. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Perspectives, principles and advanced practices for instruction geared to the Next Generation Science Standards at the elementary level. Emphasis on strategies to support elementary students in substantive conversation in a learning community and higher-order thinking and activity common to the practice of science/engineering. 4 seminars.

EDUC 542. Administration of Special Programs and Services. 4 units

Term Typically Offered: W, SP

Prerequisite: Graduate standing and consent of instructor.

Principles and practices of organizing and administering special education, reading, counseling, and other support programs. Assessment and placement procedures, middle management's role, overview of specially funded programs, historical precedents and future trends. 3 seminars, 1 activity.

EDUC 544. Advanced Collaboration and Consultation for Teachers of Students with Special Needs. 5 units

Term Typically Offered: TBD

Prerequisite: Admission into the Level I Special Education Credential Program and master's degree program in education.

Advanced studies and skills in educational consultation. Emphasis on the collaborative and consultative role of the special educator with a wide range of individuals from diverse cultural backgrounds including school personnel, parents, outside agencies, and paraprofessionals. 3 seminars, 2 activities.

EDUC 545. Characteristics and Instruction of Pupils with Mild/Moderate Disabilities. 5 units

Term Typically Offered: W

Prerequisite: Admission into the Level I Special Education Credential Program and master's degree program in education.

Advanced studies and skills in educational consultation. Emphasis on the collaborative and consultative role of the special educator with a wide range of individuals from diverse cultural backgrounds including school personnel, parents, outside agencies, and paraprofessionals. 3 seminars, 2 activities.

EDUC 546. Reading and Language Arts Instruction in Special Education. 5 units

Term Typically Offered: F

Prerequisite: Admission into the Level I Special Education Credential Program and master's degree program in education.

Overview of principles of reading instruction, elements of the language arts program including literature-based reading, content area reading, and the role of phonics, emergent literacy, and diagnosis of reading problems for special education teachers. 3 seminars, 2 activities.

EDUC 550. Assessment Strategies for Special Education. 5 units

Term Typically Offered: F

Prerequisite: Acceptance into Level I Special Education Credential Program and MA in Education, EDUC 440, EDUC 446.

Using norm referenced, criterion referenced, and curriculum based testing for assessing academic, behavioral, and physical status of individuals with exceptional needs, including English language learners, for referral purposes. Instructional and evaluation decisions regarding exceptional students in school settings. 3 seminars, 2 activities.

EDUC 552. Support and Transition Strategies in Special Education. 5 units

Term Typically Offered: W

Prerequisite: Acceptance into Level I Special Education Credential Program and MA in Education, EDUC 440, EDUC 446.

Basic guidance techniques for teachers working with exceptional individuals and their families. Career selection, preparation, and counseling. Transition from school to work, and community resource utilization. 3 seminars, 2 activities.

EDUC 553. Current Issues, Emerging Research and Practices in Special Education. 4 units

Term Typically Offered: TBD

Prerequisite: Admission to Level I Special Education Credential Program or masters degree program.

Consideration of assumptions and techniques of educational research regarding the educational, personal, social and vocational difficulties affecting the development of individuals with exceptional needs; emphasizing their applicability to general and specific educational programs. 4 seminars.

EDUC 554. Behavior Disorders and Positive Behavior Support Strategies. 5 units

Term Typically Offered: SP

Prerequisite: Acceptance into Level I Special Education Credential Program and MA in Education, EDUC 440, EDUC 446.

Assessment of students whose behavior impedes either their own learning or the learning of other students. Strategies for facilitating proactive educational, environmental and social-emotional techniques for supporting students with challenging behavior. 3 seminars, 2 activities.

EDUC 555. Introduction to the Counseling Profession. 4 units

Term Typically Offered: F

Prerequisite: Admission to MA Education program.

Overview of the counseling profession, history, philosophy, theory and ethics. Required activity. 3 seminars, 1 activity.

EDUC 556. Multicultural Counseling. 4 units

Term Typically Offered: W

Prerequisite: Admission to MA Education program.

Initiation of critical analysis of personal beliefs and attitudes regarding counseling in a diverse society. Focus on a variety of approaches to explore the beliefs and attitudes of the student in counseling settings, and examination of strategies considered effective in working with diverse populations. 3 seminars, 1 activity.

EDUC 557. Career Counseling. 4 units

Term Typically Offered: SP

Prerequisite: Admission to MA Education program.

Focus on the study and application of career development theories in career counseling. Utilizing appraisal instruments, community referral resources, occupational information, computerized retrieval systems, and personal and social data and required activities. 3 seminars, 1 activity.

EDUC 560. Counseling Theories. 4 units

Term Typically Offered: W

Prerequisite: EDUC 555 and admission to MA Education program.

Theories and practice of counseling with special emphasis on the counseling process. Emphasis of conditions of counseling, counseling techniques, counseling diverse populations and the counselor as a professional helper. 3 seminars, 1 activity.

EDUC 561. Group Counseling. 4 units

Term Typically Offered: F

Prerequisite: EDUC 555, EDUC 560 or consent of instructor.

Theory and practice of group counseling, client selection, group structure, process and termination, and application of theories to specific developmental groups. Communication and facilitation skills emphasized with relevant ethics and law. 3 seminars, 1 activity.

EDUC 562. Student Development - Higher Education. 4 units

Term Typically Offered: F

Prerequisite: Admission to MA Education program.

Exploration of the roles and competencies of the student development specialist in higher education. Review of relevant developmental theory with emphasis on practical implementation. Explore current issues and trends in higher education, and organizational framework. 4 seminars.

EDUC 564. Legal and Ethical Issues in Counseling. 4 units

Term Typically Offered: W

Prerequisite: Admission to MA Education Program.

Consideration of legal, ethical, cultural and related professional issues as they affect the practice of counseling. 3 seminars, 1 activity.

EDUC 565. Counseling Measurement and Assessment. 4 units

Term Typically Offered: SP

Prerequisite: Admission to MA Education Program, Counseling and Guidance Specialization.

Training and evaluation in the utilization of tests, scales, measures, and other instruments with K-12, and college-age students. An understanding of culturally appropriate tests and measures, collaboration with school personnel, parents, and students in the review and interpretation of test scores and measures. 3 seminars, 1 activity.

EDUC 566. Leadership and Consultation in Counseling. 4 units

Term Typically Offered: SP

Prerequisite: Admission to MA Education Program.

Development of skills in planning, organizing, coordinating, and delivering programs that generate systemic change through establishing collaboration within schools, communities and other stakeholders. Emphasis on social action and its role in the counseling profession. 3 seminars, 1 activity.

EDUC 568. Individual Counseling Techniques. 4 units

Term Typically Offered: SP

Prerequisite: Admission to MA Education Program, Counseling and Guidance Specialization.

Theory and practice of individual counseling, process and termination, and application of theories to specific developmental issues working with K-12 students. Communication and facilitation skills emphasized, working with diverse populations and following legal and ethical guidelines. 3 seminars, 1 activity.

EDUC 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

EDUC 573. Field Experience, Counseling. 1-12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: EDUC 555, EDUC 560 and Advancement to Candidacy.

Practical application of guidance services and counseling in public schools, colleges and community settings. Seminars with university staff included. Total credit limited to 24 units. Credit/No Credit grading only. Maximum of 12 units may be applied toward MA Education.

EDUC 586. Introduction to Inquiry in Education. 4 units

Term Typically Offered: F

Prerequisite: Admission to School of Education master's program.

Introduction to professional literature search techniques and to professional organizations as a basis for educational inquiry. Explanation of social construction of knowledge, and the philosophical basis of quantitative and qualitative research. 3 seminars, 1 activity.

EDUC 587. Educational Foundations and Current Issues. 4 units

Term Typically Offered: F, SU

Prerequisite: Graduate standing.

Historical, organizational, legal and philosophical characteristics of American education. Emphasis on the analysis of contemporary issues focusing on these characteristics. Course may be offered in classroom-based or online format. 4 seminars.

EDUC 588. Education, Culture, and Learning. 4 units

Term Typically Offered: SU

Prerequisite: Graduate standing.

Cultural characteristics of educational institutions and practice. Review of theory and research relating to the social and organizational context in which learning and teaching takes place. 4 seminars.

EDUC 589. Educational Research Methods. 4 units

Term Typically Offered: W, SP

Prerequisite: EDUC 586.

Introduction to research methodologies, application of inferential and descriptive statistics, critical analysis of research designs and data collection techniques. 3 seminars, 1 activity.

EDUC 590. Research Application in Education. 4 units

Term Typically Offered: SU

Prerequisite: EDUC 589.

Application of social science research techniques to problems in education and human services. Capstone experience for the School of Education master's inquiry course sequence. Completion of an inquiry project required. 2 seminars, 2 activities.

EDUC 598. Action Research Project in Education. 1-3 units

CR/NC

Term Typically Offered: F

Prerequisite: EDUC 589.

Completion and presentation of the results of an action research project that addresses a meaningful question in the practice of education. Total credit limited to 6 units. Credit/No Credit grading only.

EDUC 599. Thesis in Education. 3 units

Term Typically Offered: TBD

Prerequisite: Consent of graduate committee and supervising faculty member(s).

Completion of a thesis pertinent to the field of education. Student must register for each quarter of advisement. Total credit limited to 6 units.

Electrical Engineering (EE)

EE Courses

EE 111. Introduction to Electrical Engineering. 1 unit

Term Typically Offered: F

Concurrent: EE 151.

A general overview of the field of electrical engineering. Preparation for successful completion of the Electrical Engineering (EE) program at Cal Poly. 1 lecture. Not required for students with transfer credit for EE 211 or EE 241.

EE 112. Electric Circuit Analysis I. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 142 or equivalent. Recommended: EE 111/151.

Introduction to basic circuit analysis. Resistive circuits, voltage and current sources, network theorems. Course may be offered in classroom-based or online format. 2 lectures.

EE 133. Digital Design. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: An orientation course in student's major (EE 111 & EE 151 for EE students, CPE 100 for CPE students), CPE/CSC 101.

Number systems, Boolean algebra, Boolean functions, and function minimization. Analysis and design of combinational and sequential logic circuits. Hardware Description Language (HDL) concepts and applications digital design and synthesis in Programmable Logic Devices (PLDs). Not open to students with credit in CPE/EE 129. Course may be offered in classroom-based or online format. 3 lectures, 1 laboratory. Crosslisted as CPE/EE 133.

EE 151. Introduction to Electrical Engineering Laboratory. 1 unit

Term Typically Offered: F

Concurrent: EE 111.

A variety of hands-on experiments and demonstrations in electrical engineering, providing background and motivation for successful completion of the Electrical Engineering (EE) program at Cal Poly. Not open to students with credit for EE 241. 1 laboratory.

EE 200. Special Problems. 1-2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of department chair.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

EE 201. Electric Circuit Theory. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 244, PHYS 133.

Application of fundamental circuit laws and theorems to the analysis of DC, and steady-state single-phase and three-phase circuits. Not for electrical engineering majors. Course may be offered in classroom-based or online format. 3 lectures.

EE 211. Electric Circuit Analysis II. 3 units

Term Typically Offered: F, W, SP

Prerequisite: EE 112. Prerequisite or Concurrent: PHYS 133, MATH 244. Concurrent: EE 241.

Continuation of basic circuit analysis. Op-amp circuits. Energy storage elements, RC and RL circuits, and AC steady state analysis. 3 lectures.

EE 212. Electric Circuit Analysis III. 3 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 244, EE 211. Concurrent: EE 242.

AC power, 3-phase circuits. Mutual inductance, series and parallel resonance and two-port networks. Frequency response, including Bode plots. 3 lectures.

EE 228. Continuous-Time Signals and Systems. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BMED 355; or EE 212 and EE 242. Recommended: MATH 241.

Continuous-time systems analysis, with emphasis on linear time-invariant (LTI) systems. Classifications of continuous-time systems. Convolution and its application to LTI systems. The Laplace transform, Fourier transform, and Fourier series, and their application to the analysis of LTI systems. 4 lectures.

EE 233. Computer Design and Assembly Language Programming. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CPE/EE 133.

Design and implementation of digital computer circuits via CAD tools for programmable logic devices (PLDs). Basic computer design with its datapath components and control unit. Introduction to assembly language programming of an off-the-shelf RISC-based microcontroller. Not open to students with credit in CPE/EE 229. 3 lectures, 1 laboratory. Crosslisted as CPE/EE 233.

EE 241. Electric Circuit Analysis Laboratory II. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: EE 112; EE 151 for EE students. Prerequisite or concurrent: MATH 244; PHYS 133. Concurrent: EE 211.

Use of electrical and electronic test equipment. Experimental verification of circuit analysis concepts including Kirchhoff's Laws, Thevenin's Theorem, maximum power transfer and superposition. 1 laboratory.

EE 242. Electric Circuit Analysis Laboratory III. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: MATH 244, EE 241 or consent of department chair. Concurrent: EE 212.

Observation of transient and steady-state phenomena, phase-shift circuits, resonance. Use of phasor diagrams. 1 laboratory.

EE 251. Electric Circuits Laboratory. 1 unit

Term Typically Offered: F,W,SP,SU

Concurrent: EE 201.

Techniques of measurement of DC and steady-state AC circuit parameters. Equivalent circuits, nonlinear elements, resonance. 1 laboratory.

EE 255. Energy Conversion Electromagnetics. 3 units

Term Typically Offered: F, SP, SU

Prerequisite: EE 212 and EE 242; or EE 201 and EE 251. Concurrent: EE 295.

Fundamentals of electro-mechanical energy conversion. Magnetic circuits and electromagnetic devices. Theory of operation and operating characteristics of transformers, and AC induction and synchronous machines. 3 lectures.

EE 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

EE 271. Selected Laboratory. 1-2 units

Term Typically Offered: SP

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics. The Class Schedule will list topic selected. Total credit limited to 6 units. 1 to 2 laboratories.

EE 295. Energy Conversion Electromagnetics Laboratory. 1 unit

Term Typically Offered: F, SP, SU

Prerequisite: EE 212 & EE 242 or EE 201 & EE 251. Concurrent: EE 255.

Single-phase and three-phase transformers. Starting of rotating machines, evaluation of characteristics of rotating machines. 1 laboratory.

EE 302. Classical Control Systems. 3 units

Term Typically Offered: W, SP

Prerequisite: EE 228. Concurrent: EE 342. Recommended: EE 368.

Introduction to feedback control systems. System modeling. Transfer functions. Graphical system representation. System time response, stability. Root Locus. Frequency response. Compensation. 3 lectures.

EE 306. Semiconductor Device Electronics. 3 units

Term Typically Offered: F, W

Prerequisite: CHEM 124, EE 212 & EE 242, IME 156 or IME 157 or IME 458, PHYS 211. Concurrent: EE 346.

Internal operation, semiconductor physics, terminal characteristics, models and application of diodes (LEDs, solar cells, and photo-diodes) and transistors (field-effect and bipolar). 3 lectures.

EE 307. Digital Electronics and Integrated Circuits. 3 units

Term Typically Offered: W, SP

Prerequisite: CPE/EE 133, EE 306 and EE 346. Corequisite: CPE/EE 233. Concurrent: EE 347.

Analysis, design, application and interfacing of integrated logic circuits, including NMOS, CMOS, TTL, ECL, and other logic families. 3 lectures.

EE 308. Analog Electronics and Integrated Circuits. 3 units

Term Typically Offered: F, SP

Prerequisite: EE 302 & EE 342, EE 307 & EE 347. Concurrent: EE 348.

Analysis and design of integrated circuits for use in analog applications. Gain, frequency response, and feedback of linear small-signal amplifiers. 3 lectures.

EE 314. Introduction to Communication Systems. 3 units

Term Typically Offered: W, SP

Prerequisite: STAT 350.

Analog modulation, including: double-sideband modulation, amplitude modulation, single-sideband modulation, frequency modulation, phase modulation. Performances of such systems in the presence of white Gaussian noise. Implementations of transmitters and receivers. 3 lectures.

EE 321. Electronics. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: EE 201 or BRAE 216 for BRAE majors.

Semiconductor devices and circuits. Instrumentation amplifiers, power control rectifiers, feedback, pulse circuits, digital logic circuits. Not for Electrical Engineering majors. 3 lectures.

EE 322. Microcontrollers for Everyone. 4 units

GE Area F

Term Typically Offered: F, W, SP

Prerequisite: completion of GE Area B and Junior standing.

Recommended: MATH 118.

Microcontroller history and computer systems overview. Introduction to basic electrical circuits and computer programming concepts. Overview of computer peripherals such as LEDs, switches, LCD displays, timers, and ADCs; and interfacing various types of external sensors. Developing applications of microcontrollers using an integrated development environment. 3 lectures, 1 laboratory. Fulfills GE Area F.

EE 328. Discrete Time Signals and Systems. 3 units

Term Typically Offered: F, W, SP

Prerequisite: BMED 355 or EE 228. Concurrent: CPE/EE 368.

Discrete-time systems and analysis, with emphasis on linear time-invariant (LTI) systems. Sampling theorem. Classification of discrete-time systems. Convolution and its application to LTI systems. The z transform, discrete-time Fourier transform, and discrete Fourier transform. Introduction to digital filters. 3 lectures. Crosslisted as CPE/EE 328.

EE 329. Programmable Logic and Microprocessor-Based Systems Design. 4 units

Term Typically Offered: F, SP

Prerequisite: EE 307&347, EE 229&269 or CPE/EE 233.

Design, implementation and testing of programmable logic microprocessor-based systems. Hardware/software tradeoffs (such as timing analysis and power considerations), system economics of programmable logic and microprocessor-based system design. Interfacing hardware components (such as ADCs/DACs, sensors, transducers). 3 lectures, 1 laboratory. Not open to students with credit in CPE/EE 336. Crosslisted as CPE/EE 329.

EE 335. Electromagnetic Fields and Transmission. 4 units

Term Typically Offered: F, SP

Prerequisite: EE 201 and EE 251; or EE 212 and EE 242; and MATH 241.

Concurrent: EE 375.

Maxwell's equations. Plane wave propagation in free space. Static electric and magnetic fields. Distributed-circuit concepts and transmission line parameters. Reflections and standing waves. The Smith chart and its applications. Transmission line measurements and impedance matching techniques. 4 lectures.

EE 336. Microprocessor System Design. 4 units

Term Typically Offered: F, SP

Prerequisite: CPE/EE 233.

Introduction to microcontrollers and integrated microprocessor systems. Hardware/software trade-offs, system economics, and functional configurations. Interface design, real-time clocks, interrupts, A/D conversion, serial and parallel communications, watch-dog timers, low power operation, event-based inter-peripheral communication, and assembly and higher-level language programming techniques. Architecture and design of sampled data and low-power systems. Not open to students with credit in CPE/EE 329. 3 lectures, 1 laboratory. Crosslisted as CPE/EE 336.

EE 342. Classical Control Systems Laboratory. 1 unit

Term Typically Offered: W, SP

Prerequisite: EE 228. Concurrent: EE 302. Recommended: EE 368.

Laboratory work pertaining to classical control systems, including servo control, transient and frequency responses, stability, and computer-aided analysis of control systems. 1 laboratory.

EE 346. Semiconductor Device Electronics Laboratory. 1 unit

Term Typically Offered: F, W

Prerequisite: CHEM 124, EE 212 & EE 242, IME 156 or IME 157 or IME 458, PHYS 211. Concurrent: EE 306. Recommended: ENGL 134.

Experimental determination of device characteristics and models. 1 laboratory.

EE 347. Digital Electronics and Integrated Circuits Laboratory. 1 unit

Term Typically Offered: W, SP

Prerequisite: CPE/EE 133, EE 306 and EE 346. Corequisite: CPE/EE 233. Concurrent: EE 307.

Computer simulation and experimental investigation of the characteristics, applications and interfacing of different logic families. 1 laboratory.

EE 348. Analog Electronics and Integrated Circuits Laboratory. 1 unit

Term Typically Offered: F, SP

Prerequisite: EE 302 & EE 342, EE 307 & EE 347. Concurrent: EE 308.

Design, simulation, construction and testing of solid state amplifiers and sub-circuits to meet stated specifications. 1 laboratory.

EE 361. Electronics Laboratory. 1 unit

Term Typically Offered: F,W,SP,SU

Prerequisite: EE 251 or BRAE 216 for BRAE majors. Concurrent: EE 321.

Instrumentation amplifiers, feedback, rectifiers and power control, pulse and digital logic circuits. 1 laboratory.

EE 368. Signals and Systems Laboratory. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: BMED 355 or EE 228. Concurrent: CPE/EE 328.

Laboratory work pertaining to linear systems, including Fourier analysis, time and frequency responses, and system transfer function. 1 laboratory. Crosslisted as CPE/EE 368.

EE 375. Electromagnetic Fields and Transmission Laboratory. 1 unit

Term Typically Offered: F, SP

Concurrent: EE 335.

Transmission line and passive component measurements at microwave frequencies. Response to pulse excitation using time domain techniques and sinusoidal excitation using frequency domain techniques. Application of the Smith Chart and network analyzers in transmission line characterization and impedance matching techniques. 1 laboratory.

EE 400. Special Problems. 1-5 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 5 units.

EE 402. Electromagnetic Waves. 4 units

Term Typically Offered: F, W

Prerequisite: EE 335.

Maxwell's equations and plane wave propagation in materials. Reflection and transmission of normal and oblique incidence plane waves at planar boundaries between different media. Wave guides. Antennas. 4 lectures.

EE 403. Fiber Optic Communication. 3 units

Term Typically Offered: F

Prerequisite: EE 335 or PHYS 323. Concurrent: EE 443.

Propagation of light in optical fibers, attenuation and bandwidth. LED and Laser Diode sources for use with optical fibers. Optical sources, detectors, and receivers. Design of optical communication systems with applications in telecommunications and local area networks (LANs). 3 lectures.

EE 405. High Frequency Amplifier Design. 3 units

Term Typically Offered: F

Prerequisite: EE 308 & EE 348, EE 335. Concurrent: EE 445.

Design of modern electronic amplifiers and amplifier systems with advanced techniques. UHF and microwave small signal amplifier design utilizing microstrip transmission lines, S parameters of GaAs FET, and bipolar transistors. Low noise, broadband, and power amplifier designs. Oscillator designs. 3 lectures.

EE 406. Power Systems Analysis I. 4 units

Term Typically Offered: F

Prerequisite: EE 335, EE 255 & EE 295.

Introduction to electric power systems. Representation of power systems and its components including transmission lines, synchronous machines, transformers and loads. One line diagrams and per unit calculations. symmetrical faults. Load flow analysis. 4 lectures.

EE 407. Power Systems Analysis II. 4 units

Term Typically Offered: W

Prerequisite: EE 406.

Symmetrical components, unbalanced faults, power system stability, system protection, relays and relay systems, power system instrumentation and measurement techniques, economic operation. 4 lectures.

EE 409. Electronic Design. 3 units

Term Typically Offered: F, W

Prerequisite: EE 308 & EE 348; CPE/EE 328 & CPE/EE 368; CPE/EE 329 or CPE/EE 336. Concurrent: EE 449.

Design of electronic systems and subsystems using analog and digital integrated circuits. Design principles and techniques. Analysis and design of feedback amplifiers; operational amplifier applications. Design of analog/digital and digital/analog converters. Power supply design. Emphasis on IC implementation. 3 lectures.

EE 410. Power Electronics I. 4 units

Term Typically Offered: F

Prerequisite: EE 308 and EE 348, or EE 321 and consent of instructor.

Introduction to power electronics and power semiconductor devices. Analysis, performance characterization, and design of power electronics converters such as: rectifiers, DC choppers, AC voltage controllers, and single-phase inverters. Operation of DC motor drives. Use of commercially available software. 3 lectures, 1 laboratory.

EE 411. Power Electronics II. 4 units

Term Typically Offered: W

Prerequisite: EE 410.

Switching losses. Analysis, performance characterization, and design of snubber circuits and resonant converters. Operation of DC transmission lines, flexible AC transmission system (FACTS) controllers, three-phase inverters, and AC motor drives. Use of commercially available software. 3 lectures, 1 laboratory.

EE 412. Advanced Analog Circuits. 3 units

Term Typically Offered: W

Prerequisite: EE 314, EE 409 & EE 449. Concurrent: EE 452.

Application of linear integrated circuits to data acquisition problems: transducer interfacing, linear and nonlinear preprocessing, phase-locked loops, and high performance quantization and recovery (A/D, D/A conversion). 3 lectures.

EE 413. Advanced Electronic Design. 4 units

Term Typically Offered: SP

Prerequisite: CSC 101, EE 409 and EE 449.

Advanced design of electronic circuits and subsystems, including sustainability and design as a process. Automated testing with GPIB instruments. Implementation of specific design projects, including team-based projects. 3 lectures, 1 laboratory.

EE 415. Communication Systems Design. 3 units

Term Typically Offered: F

Prerequisite: EE 314, EE 409 and EE 449.

Design of modern electronic communication and telemetry systems. Emphasis: practical implementation and comparative evaluation of various communication systems. 3 lectures.

EE 416. Digital Communication Systems. 3 units

Term Typically Offered: F

Prerequisite: EE 314, EE 328.

Baseband (PCM, PAM, DM) signals and transmission. Bandpass (PSK, FSK, ASK) modulation and demodulation techniques. Digital communication signals in the presence of noise and detection of signals in Gaussian noise. Other topics such as: quantization, multiplexing and multiple access, spread spectrum techniques, coding, synchronization. 3 lectures.

EE 417. Alternating Current Machines. 4 units

Term Typically Offered: F

Prerequisite: EE 255 & EE 295.

Alternating current machines. Generalized, operational and dynamic analysis. Steady-state and transient operation of synchronous machines and linear induction machines. 3 lectures, 1 laboratory.

EE 418. Photonic Engineering. 3 units

Term Typically Offered: SP

Prerequisite: EE 335 or PHYS 323. Concurrent: EE 458.

Modern optical design with emphasis on the use of computers to design simple optical systems and to evaluate existing optical designs. Paraxial and exact ray tracing through thin and thick lenses, mirrors, and prisms. Radiometry and photometry. Electro-optic, acousto-optic, and magneto-optic modulators and their applications. Thermal detectors, semiconductor detectors, and charge coupled device (CCD) arrays. 3 lectures.

EE 419. Digital Signal Processing. 3 units

Term Typically Offered: W

Prerequisite: CSC 101 or CSC 231; EE 328 and EE 368. Concurrent: EE 459.

Review of Z-transform, convolution and discrete Fourier Transform. Digital filter design. Fast Fourier Transform. Theory and applications of digital signal processors. 3 lectures.

EE 420. Sustainable Electric Energy Conversion. 4 units

Term Typically Offered: W

Prerequisite: CHEM 124; EE 255 and EE 295.

Electrical engineering aspects of photovoltaic and wind power generation and usage, and electrochemical energy conversion. Power control, processing, and quality for grid-connected and stand-alone systems. Distribution and storage of electric energy. Hydrogen and synthetic fuels. Distributed generation. 3 lectures, 1 laboratory.

EE 422. Polymer Electronics Laboratory. 1 unit

Term Typically Offered: F, W

Prerequisite: EE 347 or MATE 340 or CHEM 319 or PHYS 340.

Experimental procedures in polymer electronics. Investigation of the characteristics of a polymer electronic device. 1 laboratory. Crosslisted as EE/PHYS 422.

EE 423. Micro/Nano Fabrication. 3 units

Term Typically Offered: W

Prerequisite: BMED 212 or MATE 210.

Fabrication science and technology for creating micro and nano scale devices. Explore basic processes such as oxidation, diffusion, ion implantation, etching, chemical and physical vapor deposition, photolithography. Develop an understanding of the science of each process and how to select the right steps for fabricating electronic, photon and micro-electro-mechanical systems devices. 3 lectures. Crosslisted as BMED 434/EE 423/MATE 430.

EE 424. Introduction to Remote Sensing. 4 units

Term Typically Offered: SP

Prerequisite: MATH 244; senior or graduate standing in engineering.

Radiation characteristics, sensor technology and platforms, satellite systems, system design tradeoffs, collection and transmission of radio-metric data, GPS, thermal remote sensing, active radar and microwave remote sensing, interpretation and exploitation of remotely sensed data for various applications. 3 lectures, 1 laboratory.

EE 425. Analog Filter Design. 3 units

Term Typically Offered: SP

Prerequisite: EE 409 & EE 449. Concurrent: EE 455.

Approximation Theory. All pole filters. Frequency transformations. Elements of passive synthesis. Time delay filters. Theory and design of active filter. Sensitivity analysis. 3 lectures.

EE 428. Computer Vision. 4 units

Term Typically Offered: W

Prerequisite: CPE/CSC 357 or EE 328 or ME 305.

Introduction to the concepts of 2D and 3D computer vision: low-level image processing methods such as filtering and edge detection; feature extraction; segmentation and clustering; stereo vision; appearance-based and model-based algorithms. 3 lectures, 1 laboratory. Crosslisted as CPE/EE 428.

EE 431. Computer-Aided Design of VLSI Devices. 4 units

Term Typically Offered: F

Prerequisite: EE 307 and EE 347. Recommended: EE 308 and EE 348, for students interested in analog design.

Design of VLSI circuits using state-of-the-art CAD software. Design issues and algorithms related to design using CAD. Full custom design through automated design and a major multi-week chip design project in lab. 3 lectures, 1 laboratory. Crosslisted as CPE 441/EE 431.

EE 432. Digital Control Systems. 3 units

Term Typically Offered: F

Prerequisite: EE 302 & EE 342. Concurrent: CPE/EE 472. Recommended: Prior background in discrete time systems, for example EE 328, EE 368.

Theory and applications of digital computers in linear control systems. Discrete time methods are used in analysis and design studies. Digital control systems are synthesized. 3 lectures. Crosslisted as CPE/EE 432.

EE 433. Introduction to Magnetic Design. 4 units

Term Typically Offered: SP

Prerequisite: EE 255 and EE 295.

Design of magnetic components. Fundamentals of magnetics, magnetic cores, design of power transformer, three-phase transformer, dc inductor, ac inductors, dc-dc converter transformer design, actuators. Use of commercially available software. 3 lectures, 1 laboratory.

EE 434. Automotive Engineering for a Sustainable Future. 4 units

Term Typically Offered: W

Prerequisite: Junior standing in any engineering or physical science major.

Multidisciplinary investigation of automotive renewable fuels and electric/hybrid vehicles. Analyze and design related technologies and systems. Methods for complete-cycle energy and GHG analysis. Comparative emissions, efficiency, power output, and infrastructure requirements. Laboratory projects converting engines and vehicles to operate on alternative fuels or electric propulsion. 3 lectures, 1 laboratory. Crosslisted as BRAE/EE 434.

EE 439. Introduction to Real-Time Operating Systems. 4 units

Term Typically Offered: F

Prerequisite: CPE/EE 329 or CPE/EE 336.

Theory, design and implementation of real-time operating system-based embedded systems. Scheduling algorithms, operating system resources, peripheral device interfacing and embedded system architecture. Resource management issues in a resource-limited (microcontroller-based) environment. 3 lectures, 1 laboratory. Crosslisted as CPE/EE 439.

EE 440. Wireless Communications. 3 units

Term Typically Offered: W

Prerequisite: EE 335, EE 314. Concurrent: EE 480.

Wireless microwave system design and analysis. RF transmission lines, microwave networks, receiver design, modulation techniques, and mixer characterization and realizations. Noise and distortion, RF oscillators and frequency synthesizers, filter design. Radiating systems and electromagnetic wave propagation, microwave amplifier design. 3 lectures.

EE 443. Fiber Optics Laboratory. 1 unit

Term Typically Offered: F

Prerequisite: EE 335 or PHYS 323. Concurrent: EE 403.

Experimental investigation of the properties of optical fibers, sources, and detectors. Measurement of fiber physical characteristics, attenuation, losses, and bandwidth. Evaluation of an analog and digital fiber optic data link. 1 laboratory.

EE 444. Power Systems Laboratory. 1 unit

Term Typically Offered: SP

Prerequisite: EE 406.

Protective relaying, coordination, and relay calibration. Power control using transformers, parallel operation of generators, and computer simulation of power systems. 1 laboratory.

EE 445. High Frequency Amplifier Design Laboratory. 1 unit

Term Typically Offered: F

Prerequisite: EE 308 & EE 348, EE 335. Corequisite: EE 405.

Experimental investigation employing advanced techniques. Design of high-frequency electronic amplifiers utilizing S-parameters of bipolar transistors, network analyzers, and computer simulation techniques. 1 laboratory.

EE 449. Electronic Design Laboratory. 1 unit

Term Typically Offered: F, W

Prerequisite: EE 308 & EE 348; CPE/EE 328 & CPE/EE 368; CPE/EE 329 or CPE/EE 336. Concurrent: EE 409.

Design of electronic systems and subsystems using integrated circuits. 1 laboratory.

EE 450. Solar Photovoltaic System Engineering. 4 units

Term Typically Offered: W

Prerequisite: one of the following: PHYS 104; PHYS 118; PHYS 121; or PHYS 141; and junior standing.

Engineering principles, design, and installation of solar photovoltaic power systems including grid-tie and off-grid systems. Photonic energy conversion, solar module engineering, solar power electronics, photovoltaic site planning, mechanical and structural considerations, permit processes, government incentives, and analysis of financial and investment issues. Field trips required. 3 lectures, 1 laboratory. Crosslisted as BRAE/EE/HNRS 450.

EE 452. Advanced Analog Circuits Laboratory. 1 unit

Term Typically Offered: W

Prerequisite: EE 314, EE 409 & EE 449. Concurrent: EE 412.

Advanced laboratory study of LC and VCO oscillators, phase detectors, phase-locked loop circuits, transducer interface circuits, noise sources and signal-to-noise determination, ADC and DAC for data conversion. Formal experiments and computer SPICE simulation. 1 laboratory.

EE 455. Analog Filter Design Laboratory. 1 unit

Term Typically Offered: SP

Prerequisite: EE 409 & EE 449. Concurrent: EE 425.

Advanced laboratory study of sensitivity and stability of active networks prescribed for realization of transfer functions by active network synthesis techniques. Formal experiments and individual project work. 1 laboratory.

EE 456. Digital Communication Systems Laboratory. 1 unit

Term Typically Offered: F

Prerequisite: EE 314, EE 328 and EE 368.

Methods of digital modulation and demodulation. Emphasis on spectral analysis, bandwidth requirements and other practical considerations of modulation and demodulation. 1 laboratory.

EE 458. Photonic Engineering Laboratory. 1 unit

Term Typically Offered: SP

Concurrent: EE 418.

Experimental investigation of the techniques used in processing optical signals. Formal experiments on electro-optic modulation, acousto-optic modulation. Construction of an RF spectrum analyzer. Analog processing of optical signals, and charge-coupled array devices. 1 laboratory.

EE 459. Digital Signal Processing Laboratory. 1 unit

Term Typically Offered: W

Prerequisite: CSC 101 or CSC 231; EE 328 and EE 368. Concurrent: EE 419.

Experiments in digital filter design and digital signal processing emphasizing various areas of application. Formal experiments and individual project work, including DSP algorithm and digital filter analysis, design and implementation using Matlab, and real-time implementations using C on an embedded DSP processor. 1 laboratory.

EE 460. Senior Project Preparation. 2 units

Term Typically Offered: F, W

Prerequisite: EE 314, EE 335. Corequisite: EE 409 & EE 449.

Introduction to teamwork and team-oriented project execution. Project planning, scheduling and analysis. Usage of tools for project management including Gantt and Pert Charts. Project development, cost and time estimation using top-down and bottom-up approaches. Ethics and ethical issues as they pertain to the conduct of engineering. Development of senior project proposal. 1 lecture, 1 laboratory.

EE 461. Senior Project I. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: EE 409, EE 449 and EE 460.

Investigation and design of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report.

EE 462. Senior Project II. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: EE 461.

Continuation and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report.

EE 463. Senior Project Design Laboratory I. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: EE 409, EE 449 and EE 460.

Investigation and design of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Not open to students with credit in EE 461. 2 laboratories.

EE 464. Senior Project Design Laboratory II. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: EE 463.

Continuation and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Not open to students with credit in EE 462. 2 laboratories.

EE 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 lectures.

EE 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

EE 472. Digital Control Systems Laboratory. 1 unit

Term Typically Offered: F

Concurrent: CPE/EE 432.

Design and programming of microprocessor-based digital controls for electro-mechanical plants. Topics include digital control laws, translation of transfer functions into algorithms, assembly language programming, real-time software design, sample rate selection, finite word-length considerations. 1 laboratory. Crosslisted as CPE/EE 472.

EE 480. Wireless Communications Laboratory. 1 unit

Term Typically Offered: W

Prerequisite: EE 335, EE 314. Concurrent: EE 440.

Wireless microwave system design and analysis. RF transmission lines, microwave networks, receiver design, modulation techniques, and mixer characterization and realizations. Noise and distortion, RF oscillators and frequency synthesizers, filter design. Radiating systems and electromagnetic wave propagation, microwave amplifier design. 1 laboratory.

EE 494. Cooperative Education Experience. 6-12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

EE 495. Cooperative Education Experience. 6-12 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Two consecutive quarters of EE 494 immediately preceding EE 495; sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 units.

EE 500. Individual Study. 1-3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of department chair, graduate advisor, and supervising faculty member.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Total credit limit at discretion of graduate advisor, not to exceed 9 units.

EE 502. Microwave Engineering. 4 units

Term Typically Offered: W

Prerequisite: EE 402 or equivalent.

Application of Maxwell's equations and boundary value problems to waveguide structures. Striplines and microstrip lines. S-parameters. Microwave equivalent circuit theorem. Passive microwave devices. Charge and field interactions in oscillators and amplifiers. Transferred electron devices, avalanche transit-time devices, and microwave transistors. Circuits associated with oscillators and reflection type amplifiers. 4 seminars.

EE 504. Software Defined Radio. 4 units

Term Typically Offered: SP

Prerequisite: EE 314 and EE 328; or graduate standing.

Introduction to software defined radios, including architectures of software defined radio receivers and transmitters, design principles and trade-offs, signal processing techniques, and applications of the technologies. 3 seminars, 1 laboratory.

EE 509. Computational Intelligence. 4 units

Term Typically Offered: SP

Prerequisite: Senior or graduate standing.

Theory, design, and applications of biologically inspired computational paradigms, including artificial neural networks, evolutionary computation, swarm intelligence, and hybrid intelligent systems. 4 seminars.

EE 511. Electric Machines Theory. 4 units

Term Typically Offered: W

Prerequisite: EE 255 or equivalent, and graduate standing or consent of instructor.

Advanced topics in electric machines theory. Introduction to Park's transformation. Analysis of electric machines using Kron's generalized concept. Vector control of induction machines. 4 seminars.

EE 513. Control Systems Theory. 4 units

Term Typically Offered: W

Prerequisite: EE 302 or equivalent, and graduate standing or consent of instructor.

State representation of dynamic systems. Mathematical models of physical devices, controllability and observability. Design of closed-loop systems. Optimal control theory. 4 seminars.

EE 514. Advanced Topics in Automatic Control. 4 units

Term Typically Offered: SP

Prerequisite: EE 513 or equivalent, EE 328 or similar course on discrete-time linear systems.

Summary course covering five selected graduate-level topics in automatic control theory and practice; implementation issues in digital control, nonlinear control theory and design, LQ and time optimal control, variable structure control, and fuzzy logic/model-free control. 4 seminars.

EE 515. Discrete Time Filters. 4 units

Term Typically Offered: F

Prerequisite: EE 314 or equivalent, and graduate standing or consent of instructor.

Advanced topics in filter design and implementation. Emphasis placed on current applications and on the processing of real signals. Topics may include signal analysis via spectral estimation, short time Fourier transforms, and spectrograms. Effects of coefficient quantization, and limits of practical filters. State space realization. Optimal and adaptive filters for signal prediction, system identification, and noise cancellation. Techniques implemented in programming assignments. 4 seminars.

EE 516. Pattern Recognition. 4 units

Term Typically Offered: SP

Prerequisite: STAT 312 or STAT 350.

Fundamental topics in statistical pattern recognition including Bayesian decision theory, Maximum-likelihood and Bayesian estimation, non-parametric density estimation, feature selection, dimension reduction, and clustering, with application to image pattern recognition. 3 seminars, 1 laboratory.

EE 518. Power System Protection. 4 units

Term Typically Offered: SP

Prerequisite: EE 406 or equivalent, and graduate standing or consent of instructor.

Unsymmetrical faults. Protection fundamentals. Instrument transformers. Power system grounding. Generator protection, transformer protection, busbar protection, line and motor protection. 4 seminars.

EE 519. Advanced Analysis of Power Systems. 4 units

Term Typically Offered: SP

Prerequisite: EE 406 or equivalent, and graduate standing or consent of instructor.

Advanced power system stability analysis, numerical methods in power system analysis. 4 seminars.

EE 520. Solar-Photovoltaic Systems Design. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor.

Solar radiation and insolation variability. Solar cell theory. Photovoltaic module and array design. Interfacing PV generators with various kinds of loads. Power processing circuits and systems. Energy storage options. Stand-alone and grid-connected systems. Economic and policy issues. 4 seminars.

EE 521. Computer Systems. 4 units

Term Typically Offered: SP

Prerequisite: CPE/EE 329 or CPE/EE 336, or equivalent, and graduate standing or consent of instructor.

Organization of modern general purpose, high speed digital computer systems. Design of arithmetic units, control units, memories and memory subsystems. Cost, power and speed trade-offs in the design of such systems. 3 seminars, 1 laboratory. Crosslisted as CPE/EE 521.

EE 522. Advanced Real-Time Operating Systems Design. 4 units

Term Typically Offered: W

Prerequisite: CPE/EE 439.

Define and implement a microcontroller-based Real-Time Operating System (RTOS). Advanced real-time concepts, kernel structure, task and time management, various intertask communication constructs including semaphores, queues and mailboxes. Scheduler design, memory management and shared resource management in a resource-constrained microcontroller environment. 3 seminars, 1 laboratory. Crosslisted as CPE/EE 522.

EE 523. Digital Systems Design. 4 units

Term Typically Offered: F

Prerequisite: CPE/EE 329 or CPE/EE 336, and graduate standing.

Full-custom design and analysis of digital circuits using full CMOS, pass-transistor and dynamic circuit topologies. Transistor sizing for minimizing power consumption, delay and other design criteria. 3 seminars, 1 laboratory. Crosslisted as CPE/EE 523.

EE 524. Solid State Electronics. 3 units

Term Typically Offered: SP

Prerequisite: PHYS 412 or equivalent, and graduate standing or consent of instructor.

Physical theory of solid-state devices. Properties of metal-semiconductor junctions and p-n junctions. Derivation of properties of diodes, transistors, and four-layer devices from basic physical and mathematical considerations. 3 seminars.

EE 525. Stochastic Processes. 4 units

Term Typically Offered: F

Prerequisite: STAT 350 or equivalent, and graduate standing or consent of instructor.

Probability and stochastic processes used in random signal analysis. Response of linear systems to random inputs. Auto-correlation and power spectral densities. Applications in signal processing using the discrete Kalman filter. 4 seminars.

EE 526. Advanced Digital Communications. 4 units

Term Typically Offered: W

Prerequisite: EE 314, EE 416, and graduate standing.

Modern digital communication systems. M-ary signals. Vector space representation of signals. Optimum receiver principles. Common signal sets. Signal space dimensionality versus time-bandwidth product. 4 seminars.

EE 527. Advanced Topics in Power Electronics. 4 units

Term Typically Offered: SP

Prerequisite: EE 410 or equivalent, and graduate standing or consent of instructor.

Selected advanced topics in power electronics such as dc-dc converters, phase-controlled rectifiers, switched-mode inverters, ac and dc drives, HVDC transmission, or utility applications of power electronics. 4 seminars.

EE 528. Digital Image Processing. 4 units

Term Typically Offered: F

Prerequisite: EE 314 or equivalent, EE 525, and graduate standing or consent of instructor.

Processing and interpretation of images by computer. Emphasis on current applications with real images used in programming assignments. Topics may include histogram equalization, 2-D convolution, correlation, frequency-domain processing, median filtering, compression, Hough transform, segmentation and region growing, morphological operations, texture description, shape description, Bayes classifier. 4 seminars.

EE 529. Microwave Device Electronics. 3 units

Term Typically Offered: W

Prerequisite: EE 306 or graduate standing.

Emphasis on device theory of operation, fabrication techniques and circuit principles of active microwave solid-state devices, their noise aspects and systems applications. 3 seminars.

EE 530. Fourier Optics. 4 units

Term Typically Offered: W

Prerequisite: EE 402 or equivalent, EE 314 or equivalent, and graduate standing or consent of instructor.

Approach to the design and analysis of optical systems using linear communication theory, including Fourier analysis. Analysis of two-dimensional signals and systems, foundations of scalar diffraction theory. Fresnel and Fraunhofer diffraction. Wave-optics analysis of coherent optical systems, frequency analysis of optical imaging systems, holo-graphy. 4 seminars.

EE 533. Antennas. 4 units

Term Typically Offered: SP

Prerequisite: EE 402 or equivalent.

Principles of antenna theory. Antenna parameters, radiation integrals. Duality and reciprocity theorems. Wire antennas. Antenna arrays. Traveling wave antennas. Broadband and frequency independent antennas. Aperture and reflector antennas. Microstrip antennas. Antenna design. 4 seminars.

EE 541. Advanced Microwave Laboratory. 2 units

Term Typically Offered: W

Prerequisite: EE 402 or equivalent and graduate standing.

Experimental measurement in waveguide and microstrip circuits employing the advanced Network Analyzer. Design of both passive and active microwave circuits using microstrip. Graphical and analytical design techniques as well as the use of computer-aided design codes. 2 laboratories.

EE 544. Solid-state Electronics and VLSI Laboratory. 1 unit

Term Typically Offered: SU

Prerequisite: Graduate standing; EE 431 or EE 524 (EE 524 may be taken concurrently).

Experimental procedures in solid-state electronics and integrated circuits. Investigation and improvement of the characteristics of solid-state electronic devices and integrated circuits. 1 laboratory.

EE 563. Graduate Seminar. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Current developments in the fields of electrical and electronic engineering. Participation by students, faculty and guest lecturers. Open to graduate students with a background in electrical or electronic engineering. Credit/No Credit grading only. Total credit limited to 3 units. 1 seminar.

EE 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors with electrical and electronic engineering background. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 seminars.

EE 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

EE 594. Cooperative Education Experience. 6-12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only. Total credit limited to 24 units.

EE 595. Cooperative Education Experience. 6-12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed formal report and evaluation by work supervisor required. Total credit limited to 12 units.

EE 599. Design Project (Thesis). 1-9 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the requirement for the degree. An appropriate experimental or analytical thesis or project may be accepted.

Engineering (ENGR)

ENGR Courses

ENGR 101. Engineering Student Success. 1 unit

CR/NC

Term Typically Offered: F

Strategies for success as an engineering student, including development of intrinsic motivation, time management, self-advocacy, campus resources, and career preparation. Engineering design process, teamwork, and communication skills. Credit/No Credit grading only. 1 activity.

ENGR 110. Introduction to Engineering. 2 units

Term Typically Offered: F

Introduction to engineering and the computing disciplines with emphasis on the design process, professionalism, communication, teamwork, diversity and skills for academic success in engineering. 2 lectures.

ENGR 234. Introduction to Design Thinking. 4 units

Term Typically Offered: W

Prerequisite: Entrepreneurship minors only.

Introduction to the process of design thinking and human centered design, including design process, methodology, and implementation. Empathy, creativity, iterative prototyping, and contextual design of products and services. 4 lectures.

ENGR 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ENGR 301. Engineering Professional Success. 1 unit

CR/NC

Term Typically Offered: F

Prerequisite: Consent of instructor. Recommended: ENGR 101.

Strategies for success as an engineering professional. Preparation for job searches, including networking and building a professional identity. Exploration of engineering within context of society and community. Intended for First Generation and new transfer students. Credit/ No Credit grading only. 1 activity.

ENGR 302. Transportation and Manufacturing in the Twenty-First Century. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B.

Role of transportation and manufacturing technology in the twenty-first century. Effects of technological change upon society, and the principles associated with the advancement of transportation and manufacturing technologies in the automotive industry and the industrial-military complex. Case studies of systems to compare alternative approaches to problem solving. 4 lectures. Fulfills GE Area F.

ENGR 310. Introduction to Entrepreneurship. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

Role and impact of entrepreneurship and technology startups; characteristics and traits of entrepreneurs; opportunity identification and assessment; frameworks for building startups; the founding team; organizational and legal issues; business and value proposition models; acquiring resources; entrepreneurial risk; realizing and harvesting value. 4 lectures. Crosslisted as BUS/ENGR 310.

ENGR 322. The Learn By Doing Lab Teaching Practicum. 2 units

CR/NC

Term Typically Offered: W

Prerequisite: Completion of GE Area B.

Early teaching experience in an informal science, technology, engineering, and mathematics (STEM) teaching and learning environment. Principles of inquiry-driven STEM education, lesson design, implementation and assessment. Intended for undergraduates exploring STEM teaching as a career. Total credit limited to 4 units. Credit/No Credit grading only. 1 seminar, 1 laboratory. Crosslisted as ENGR 322/SCM 302/HNRS 302.

ENGR 334. Needfinding in New Product Design. 4 units

Term Typically Offered: SP

Prerequisite: BMED 212, ENGR 234, IME 144, or ME 234.

Identification and characterization of human needs for future products, systems, services, and environments. Observation and interview techniques based on ethnographic approaches and building design empathy. Emphasis on development of broad and flexible thinking skills for designers to address the needs of a changing society. Field trips required. 4 lectures.

ENGR 350. The Global Environment. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area B.

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/ historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 4 lectures. Crosslisted as AG/EDES/ENGR/GEOG/ISLA/SCM/UNIV 350. Fulfills GE Area F.

ENGR 400. Special Problems for Advanced Undergraduates. 2-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: ME 212 or consent of department head.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units.

ENGR 440. Engineering as a Profession. 3 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Preparation for the transition from academia to industry. Working knowledge of key topics such as leadership, organizational structure, intellectual property, business models, and product development cycles, along with an appreciation of impact of technology on society. 3 lectures.

ENGR 451. Special Topics in Bioengineering. 4 units

Term Typically Offered: W

Prerequisite: Senior standing.

Current topics in bioengineering, including medical applications and industrial applications. Total credit limited to 16 units, with a maximum of 4 units per quarter. See The Schedule of Classes for topic selected. 4 lectures.

ENGR 459. Interdisciplinary Senior Design Project I. 2 units

Term Typically Offered: F

Prerequisite: Senior standing.

First of three courses taken sequentially in a team based interdisciplinary senior design project. Development of sponsor's needs and generation of design solutions. Project management, cost analysis, intellectual property, test plans, impact analysis on society, and ethical considerations. Communication of results to project sponsor. 2 laboratories.

ENGR 460. Interdisciplinary Senior Design Project II. 2 units

Term Typically Offered: W

Prerequisite: ENGR 459.

Continuation of ENGR 459 and senior project. Activities focus on detail design, analysis and material procurement. 2 laboratories.

ENGR 461. Interdisciplinary Senior Design Project III. 2 units

Term Typically Offered: SP

Prerequisite: ENGR 460.

Continuation of ENGR 460 and completion of senior project. Design verified through prototyping and testing. 2 laboratories.

ENGR 462. Senior Project. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: ME 212, junior standing, and consent of instructor.

Selection and completion of project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results presented in a formal report. Minimum commitment of 150 hours.

ENGR 463. Interdisciplinary Entrepreneurial Senior Design Project I. 2 units

Term Typically Offered: F

Prerequisite: Senior standing.

First of three courses taken sequentially in a team based interdisciplinary senior design project with engineering and business students. Entrepreneurial process through design of a product or service, using customer development and agile engineering. 2 laboratories.

ENGR 464. Interdisciplinary Entrepreneurial Senior Design Project II. 2 units

Term Typically Offered: W

Prerequisite: ENGR 463.

Continuation of ENGR 463 and a team based interdisciplinary senior design project with engineering and business students. 2 laboratories.

ENGR 465. Interdisciplinary Entrepreneurial Senior Design Project III. 2 units

Term Typically Offered: SP

Prerequisite: ENGR 464.

Continuation of ENGR 464 and a team based interdisciplinary senior design project with engineering and business students. 2 laboratories.

ENGR 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

ENGR 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

ENGR 481. Senior Project Design Laboratory I. 2 units

Term Typically Offered: TBD

Prerequisite: MATH 244, IME 314, ME 302 or consent of instructor.

Selection, development, and completion of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning scheduling and research and may involve students from several disciplines. Formulation of outline, literature review, and project schedule. 2 laboratories.

ENGR 482. Senior Project Design Laboratory II. 2 units

Term Typically Offered: TBD

Prerequisite: ENGR 481.

Selection, development, and completion of project by individuals or team which is typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning scheduling and research and may involve students from several disciplines. Formulation of outline, literature review, and project schedule. 2 laboratories.

ENGR 483. Senior Project Design Laboratory III. 2 units

Term Typically Offered: TBD

Prerequisite: ENGR 482.

Continuation of ENGR 482. Completion of project by individuals or team typical of problems graduates must solve in their fields of employment or applied research. Project may involve, but is not limited to, physical modeling and testing of integrated design projects, costs, planning, scheduling and research, and may involve students from several disciplines. Formulation of outline, literature review, and project schedule. 2 laboratories.

ENGR 493. Cooperative Education Experience. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units.

ENGR 494. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units.

ENGR 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

ENGR 500. Individual Study. 2-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of Program Director.

Advanced study planned and completed under the direction of faculty. Open to graduate students who have demonstrated the ability to do independent work. Total credit limited to 8 units.

ENGR 551. Advanced Topics in Bioengineering. 4 units

Term Typically Offered: TBD

Prerequisite: ENGR 450 or consent of instructor.

Current topic in bioengineering research/application in detail, including medical applications and industrial applications. Takes advantage of capabilities of resident or visiting faculty. Total credit limited to 16 units. See The Schedule of Classes for topic selected. 4 lectures.

ENGR 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

ENGR 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

ENGR 581. Biochemical Engineering. 4 units

Term Typically Offered: TBD

Prerequisite: CHEM 312 and MCRO 221.

Types of microorganisms and microbially-mediated biochemical reactions for biotechnology applications. Stoichiometric and thermodynamic principles for microbial growth and metabolism. Material and energy balances for aerobic and anaerobic growth and bioreactor design. Kinetics of enzyme catalyzed reactions. Field trips required. 3 seminars, 1 laboratory. Crosslisted as ENGR/ENVE 581.

ENGR 593. Cooperative Education Experience. 2 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only.

ENGR 594. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only.

ENGR 595. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. A fully-developed formal report and evaluation by work supervisor required. Credit/No Credit grading only.

ENGR 596. Industry Sponsored Project Experience. 1-9 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing.

Designed for MS students who are performing a work-for-others research project that requires a Non-disclosure Agreement. Students who qualify will be required file a detailed, supervised report and undergo an examination on the work performed. Total credit limited to 9 units. 1 to 9 supervision.

ENGR 599. Design Project (Thesis). 1-9 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing.

Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the degree requirement. An appropriate experimental or analytical thesis or project may be accepted.

English (ENGL)

ENGL Courses

ENGL 92. Basic Writing. 4 units

CR/NC

Term Typically Offered: F

Instruction in the writing process. Practice in the strategies of writing, revising, and editing paragraphs and essays with attention paid to focus, support, and organization. Directed readings of exemplary prose. Not for baccalaureate credit. Credit/No Credit grading only. 4 lectures. Formerly ENGL 102.

ENGL 93. Essay Writing for English as a Second Language Students. 4 units

CR/NC

Term Typically Offered: F

Practice in essay writing with special attention paid to the writing process. Focus on using details and examples for effective development. Review of grammar problems specific to ESL students. Journal writing to enhance fluency. Directed readings of essays and fiction. Not for baccalaureate credit. Credit/No Credit grading only. 4 lectures. Formerly ENGL 113.

ENGL 96. Writing and Rhetoric Tutorial. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Concurrent: ENGL 92, ENGL 133, or ENGL 134.

Directed, weekly practice in writing in a laboratory environment. Open to all students enrolled in ENGL 92, ENGL 133, or ENGL 134; required of all students scoring below 147 on the English Placement Test (EPT). Students scoring below 147 must enroll in the Writing and Rhetoric Stretch Program and take ENGL 96 during the second quarter of the stretch class, concurrently with ENGL 133 or ENGL 134. Not for baccalaureate credit. Credit/No Credit grading only. 1 laboratory. Formerly ENGL 103.

ENGL 98. Graduation Writing Requirement Preparation. 4 units

CR/NC

Term Typically Offered: TBD

Prerequisite: At least two unsuccessful attempts at the GWR.

Writing practice of extemporaneous expository and argumentative essays under time pressure. Discussion and application of rhetorical and grammatical principles through critical reading of student and professional essays. Satisfactory completion of the course fulfills the Graduate Writing Requirement. Not for baccalaureate credit. Credit/No Credit grading only. 4 lectures. Formerly ENGL 115.

ENGL 129. Multilingual Approaches to Academic Writing Stretch (Part I). 4 units

CR/NC

Term Typically Offered: F

Part one of a two-part stretch course sequence. Introduction to academic writing for bilingual and multilingual audiences. Draft, revise, and edit brief, weekly writing assignments to develop fluency in composing English for academic purposes. Credit/No Credit grading only. 4 lectures.

ENGL 130. Multilingual Approaches to Academic Writing Stretch (Part II). 4 units

GE Area A1

Term Typically Offered: W

Prerequisite: ENGL 129. Concurrent: ENGL 135.

Part two of a two-part stretch course sequence. Rhetorical principles of and strategies for producing effective academic writing for multilingual audiences. Focus on genre awareness, strategic responses to a range of rhetorical situations across multiple languages, cultures, and style issues appropriate for bilingual and multilingual writers. 4 lectures. Fulfills GE Area A1.

ENGL 131. Writing and Rhetoric Stretch (Part I). 4 units

CR/NC

Term Typically Offered: F

Part one of a two-part stretch course sequence. Rhetorical principles of and strategies for producing effective academic writing. Writing as a recursive process that leads to greater organizational coherency, stylistic complexity, and rhetorical awareness. Credit/No Credit grading only. 4 lectures.

ENGL 132. Writing and Rhetoric Stretch (Part II). 4 units

GE Area A1

Term Typically Offered: W

Prerequisite: ENGL 131. Concurrent: ENGL 135.

Part two of a two-part stretch course sequence. Rhetorical principles of and strategies for producing effective academic writing. Writing as a recursive process that leads to greater organizational coherency, stylistic complexity, and rhetorical awareness. 4 lectures. Fulfills GE Area A1.

ENGL 133. Writing & Rhetoric for English as a Second Language Students. 4 units

GE Area A1

Term Typically Offered: F, W

Prerequisite: satisfactory score on the English Placement Test or GE A1 eligibility for Written Communication Placement upon admissions.

Rhetorical principles and tactics applied to written work. Writing as a recursive process that leads to greater organizational coherency, stylistic complexity, and rhetorical awareness with an emphasis on grammatical elements appropriate for English as a Second Language students. 4 lectures. Fulfills GE Area A1; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A1.

ENGL 134. Writing and Rhetoric. 4 units

GE Area A1

Term Typically Offered: F, W, SP

Prerequisite: Satisfactory score on the English Placement Test or GE A1 eligibility for Written Communication placement upon admissions.

Rhetorical principles and tactics applied to written work. Writing as a recursive process that leads to greater organizational coherency, stylistic complexity, and rhetorical awareness. 4 lectures. Fulfills GE Area A1; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A1.

ENGL 135. Writing and Rhetoric Tutorial. 1 unit

CR/NC

Term Typically Offered: F,W,SP,SU

Corequisite: ENGL 129, ENGL 130, ENGL 131, ENGL 132, ENGL 133, or ENGL 134.

Guided discussion and practice of writing strategies for students seeking support for first-year composition-related coursework. Weekly, individualized hour-long sessions with a peer writing consultant offering feedback based on the audience, purpose, and context of a writing task. Open to all students enrolled in ENGL 129, ENGL 131, ENGL 133, or ENGL 134; required of all students enrolled in ENGL 130 or ENGL 132. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

ENGL 145. Reasoning, Argumentation, and Writing. 4 units

GE Area A3

Term Typically Offered: F,W,SP,SU

Prerequisite: Completion of GE Area A1 with a grade of C- or better.

Recommended: Completion of GE Area A2.

The principles of reasoning in argumentation. Examination of rhetorical principles and responsible rhetorical behavior. Application of these principles to written and oral communications. Effective use of research methods and sources. 4 lectures. Crosslisted as COMS/ENGL/HNRS 145. Fulfills GE A3; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A3.

ENGL 148. Reasoning, Argumentation and Professional Writing. 4 units

GE Area A3

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A1 with a grade of C- or better.

Recommended: Completion of GE Area A2.

The principles of reasoning in professional writing. Discussion and application of rhetorical principles, both oral and written, in professional environments. Study of methods, resources and common formats used in corporate or research writing. 4 lectures. Crosslisted as ENGL/HNRS 148. Fulfills GE A3; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A3.

ENGL 149. Technical Writing for Engineers. 4 units

GE Area A3

Term Typically Offered: F,W,SP,SU

Prerequisite: Completion of GE Area A1 with a grade of C- or better. For Engineering students only. Recommended: Completion of GE Area A2.

The principles of technical writing. Discussion and application of rhetorical principles in technical environments. Study of methods, resources and common formats used in corporate or research writing. 4 lectures. Crosslisted as ENGL/HNRS 149. Fulfills GE A3; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A3.

ENGL 150. Writing Tutorial. 1 unit

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Completion of GE Area A1 with a grade of C- or better and consent of instructor.

Guided discussion and practice of writing strategies for students seeking support for writing-related coursework and/or the GWR. Weekly, individualized and group sessions with a peer writing consultant offering feedback based on the audience, purpose, and context of a writing task. Credit/No Credit only. Total credit limited to 4 units. 1 activity.

ENGL 202. Introduction to Literary Studies. 4 units

Term Typically Offered: W, SP

Prerequisite: Completion of GE A1 with a grade of C- or better; for English majors only.

Introduction to literary genres, concepts, and terms. Emphasis on explication and interpretation, and on writing about literature. 4 lectures.

ENGL 203. Core I: 450-1485. 4 units

Term Typically Offered: F, W

Prerequisite: Completion of GE Area A with a grade of C- or better; and ENGL 251. For English majors only.

Representative canonical and non-canonical readings in the literature of the period. Selections may include such readings as Beowulf, Chaucer, Dante, a mystery or morality play, the Pearl Poet and others, as chosen by the instructor. 4 lectures.

ENGL 204. Core II: 1485-1660. 4 units

Term Typically Offered: W, SP

Corequisite: ENGL 203; for English majors only.

Representative canonical and non-canonical readings in the literature of the period. Selections may include such readings as Bradstreet, Donne, Milton, Shakespeare, Spenser, and others, as chosen by the instructor. 4 lectures.

ENGL 205. Core III: 1660-1789. 4 units

Term Typically Offered: F, SP

Corequisite: ENGL 204; for English majors only.

Representative canonical and non-canonical readings in the literature of the period. Selections may include such readings as Defoe, Franklin, Pope, Swift, Wheatley, and others, as chosen by the instructor. 4 lectures.

ENGL 221. Introduction to Technical and Professional Communication. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Areas A1 and A3 with a grade of C- or better; and one course in GE Area B.

Introduction to the rhetorical, stylistic, and genre conventions used in technical and professional communication. Emphasis on the analysis, evaluation, and production of technical and professional documents. Required for Technical and Professional Communication Certificate Program. 4 lectures.

ENGL 230. Masterworks of British Literature through the Eighteenth Century. 4 units

GE Area C1

Term Typically Offered: W

Prerequisite: Completion of GE Area A with a grade of C- or better.

Covers a thousand years of British literature, from the eighth to the eighteenth century and may include such readings as Beowulf, The Canterbury Tales, Utopia, Othello, Paradise Lost, Oroonoko and Gulliver's Travels. 4 lectures. Fulfills GE C1.

ENGL 231. Masterworks of British Literature from the Late 18th Century to the Present. 4 units

GE Area C1

Term Typically Offered: F, SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

Broadly surveys Romantic, Victorian, Modern, and Contemporary British literature in an historical-cultural context. Investigates works from several genres and a variety of national and cultural voices. May include such writers as Wordsworth, Wollstonecraft, Dickens, G. Eliot, Wilde, Woolf, Yeats, and Gordimer. 4 lectures. Crosslisted as ENGL 231/HNRS 232. Fulfills GE C1.

ENGL 241. American Literature: Beginnings to 1865. 4 units

GE Area C1

Term Typically Offered: F

Prerequisite: Completion of GE Area A with a grade of C- or better.

Survey of early American literature from pre-Columbian era to end of Civil War. A range of writers and genres, including indigenous creation stories, early exploration documents, first contact narratives, colonial histories, sermons, poetry, essays, autobiographies, drama, and fiction. Not open to students with credit in ENGL 240. 4 lectures. Fulfills GE C1.

ENGL 242. American Literature: 1830 to the Present. 4 units

GE Area C1

Term Typically Offered: F, SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

A broad survey of later American literature from the rise of literary nationalism to the present. A wide range of writers and genres, including novels, short stories, poems, plays, essays, and autobiographies. Not open to students with credit in ENGL 240. 4 lectures. Crosslisted as ENGL/HNRS 242. Fulfills GE C1.

ENGL 251. Great Books I: Introduction to Classical Literature. 4 units

GE Area C1

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

Examination of the ancient epics and classical literature of Mesopotamia, Greece, and Rome. May include such readings as The Epic of Gilgamesh, the Iliad, the Odyssey, Genesis, Exodus, Antigone, the Symposium, the Aeneid, and Marcus Aurelius's Meditations. 4 lectures. Crosslisted as ENGL/HNRS 251. Fulfills GE C1.

ENGL 252. Great Books II: Medieval to Enlightenment Literature. 4 units

GE Area C1

Term Typically Offered: W

Prerequisite: Completion of GE Area A with a grade of C- or better.

Examination of key works marking the transition from Mediterranean Classicism (c. 500 CE) to an emergent European tradition (c. 1800 CE). May include such readings as Augustine's Confessions, Song of Roland, Egil's Saga, the Consolation of Philosophy, The Romance of Tristan, the Inferno, Cellini's Autobiography, Utopia, Princess of Cleves, Candide, Discourse on Method, and Rousseau's Confessions. 4 lectures. Fulfills GE C1.

ENGL 253. Great Books III: Romanticism to Modernism Literature. 4 units

GE Area C1

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

Examination of key works marking the Romantic Revolution and the realist and modernist movements that followed in its wake. May include such readings as the poetry of Blake, Wordsworth, Eliot, Rimbaud, Plath, Ginsberg, and Stein; Notes from Underground, The Death of Ivan Ilych, The Metamorphosis and/or The Hunger Artist, Heart of Darkness, 'Sonny's Blues,' and Virginia Woolf's short fiction and essays. 4 lectures. Fulfills GE C1.

ENGL 260. Children's Literature. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A with a grade of C- or better.

Analysis and evaluation of traditional literature, fantasy, realistic fiction, historical fiction, informational books, picture books, and poetry for children in multiple subject classroom grades K-6. Emphasis on multicultural texts. 4 lectures. Crosslisted as ENGL/LS 260.

ENGL 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ENGL 290. Introduction to Linguistics. 4 units

Term Typically Offered: F, W

Prerequisite: Completion of GE Area A with a grade of C- or better.

Introduction to the nature of language; concepts and methods of linguistic science. 4 lectures.

ENGL 302. Writing: Advanced Composition. 4 units

GWR

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

Writing and analysis of expository and argumentative papers at an advanced level. Special attention paid to issues of style and voice. Critical reading of models of effective writing. 4 lectures. Fulfills GWR.

ENGL 303. Core IV: 1789-1861. 4 units

Term Typically Offered: F, W

Corequisite: ENGL 205; for English majors only.

Representative canonical and non-canonical readings in the literature of the period. May include such authors as Austen, Emerson, Hawthorne, Keats, Wordsworth, and others, as chosen by the instructor. 4 lectures.

ENGL 304. Core V: 1861-1914. 4 units

Term Typically Offered: W, SP

Corequisite: ENGL 303; for English majors only.

Representative canonical and non-canonical readings in the literature of the period. May include such authors as Arnold, Dickinson, James, Tennyson, Whitman, and others, as chosen by the instructor. 4 lecture.

ENGL 305. Core VI: 1914 - Present. 4 units

Term Typically Offered: F, SP

Corequisite: ENGL 304; for English majors only.

Representative canonical and non-canonical readings in the literature of the period. May include such authors as Eliot, Faulkner, Morrison, Woolf, Yeats, and others, as chosen by the instructor. 4 lectures.

ENGL 310. Corporate Communication. 4 units

GWR

Term Typically Offered: F,W,SP,SU

Prerequisite: Completion of GE Area A with a grade of C- or better.

Recommended: Junior standing.

Instruction and practice in forms of communication characteristic of business and industry. 4 lectures. Fulfills GWR.

ENGL 317. Technical Editing. 4 units

GWR

Term Typically Offered: F

Prerequisite: Completion of GE Area A with a grade of C- or better.

Recommended: Junior standing.

Instruction and practice in editing skills commonly used in workplace settings. Includes practical instruction in copyediting, sentence level editing, and substantive editing for accuracy and consistency. Editing documents, illustrations, web pages for consistency and use. Application of grammar and punctuation. 4 lectures. Fulfills GWR.

ENGL 319. Information Design and Production. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A with a grade of C- or better.

Recommended: Junior standing.

Mid-level presentation of the theory and practice involved with the production of technical documents. Focus on history, typography, information design principles, the effective integration of text and graphics, project management, and recent industry trends in software use. 4 lectures.

ENGL 330. British Literature in the Age of Belief: to 1485. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

The historical development of medieval English literature through selected canonical and non-canonical works of various genres. Medieval authorship and textual practice, the relationship between gender and writing, and the forging of a national poetic identity. Interdisciplinary support material (artwork and music) illustrating key themes. 4 lectures. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 331. British Literature in the Age of Discovery: 1485-1660. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

The literary, historical, political, religious and scientific concerns of the Age of the Renaissance. May include such readings as More's Utopia, Spenser's Faerie Queene, Shakespeare's Othello, Donne's Songs and Sonnets, Milton's Paradise Lost. 4 lectures. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 332. British Literature in the Age of Enlightenment: 1660-1798. 4 units

GE Area C4; GWR

Term Typically Offered: W, SP

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

In-depth exploration of the dominant themes and preoccupations of the Age of Enlightenment. Historical and cultural contexts of canonical and non-canonical literature emphasized to illustrate 18th century Britons' views of themselves and their changing world. May include such writers as Dryden, Behn, Defoe, Swift, Pope, and Johnson. 4 lectures. Crosslisted as ENGL/HNRS 332. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 333. British Literature in the Age of Romanticism: 1798-1832. 4 units

GE Area C4; GWR

Term Typically Offered: W, SP

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

In-depth exploration of the literature of the British Romantic period. Cultural, historical, and philosophic contexts will also be examined in both canonical and non-canonical works. May include such writers as Blake, Wordsworth, Keats, and Wollstonecraft. 4 lectures. Crosslisted as ENGL/HNRS 333. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 334. British Literature in the Age of Industrialism: 1832-1914. 4 units

GE Area C4; GWR

Term Typically Offered: W, SP

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

In-depth study of historical, philosophical, and literary reaction to the rise of the modern industrial state. Special focus on the literary response to the following: industry, democracy, class, art, and culture. 4 lectures. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 335. British Literature in the Age of Modernism: 1914-Present. 4 units

GE Area C4; GWR

Term Typically Offered: W

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

In-depth exploration of the dominant concerns and achievements of British literature from Modernism through Postmodernism. Historical and cultural contexts of canonical and non-canonical literature explored to illustrate 20th century Britain's reactions to the breakdown of traditional beliefs, the World Wars, the legacy of colonialism, the changing politics and problems of a multicultural nation. May include such writers as Conrad, Joyce, Woolf, Yeats, Heaney, Ishiguro, Walcott. 4 lectures. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 339. Introduction to Shakespeare. 4 units

GE Area C4; GWR

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Shakespeare's works as texts, productions and major historical, aesthetic and cultural touchstones. The author's intellectual and social influences on four centuries of theatre and his subsequent impact on literature and other arts. 4 lectures. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 340. The Literary Sources of the American Character: 1600-1865. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

The literature of the United States from its sources in the accounts of the early British and Spanish explorers to the works of the American Renaissance. The relationship between mainstream and marginalized voices in the American character. 4 lectures. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 341. The Literary Sources of the American Character: 1865-1914. 4 units

GE Area C4; GWR

Term Typically Offered: SP

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Analysis of literary Realism and Naturalism in their cultural and historical contexts. May include such writers as Whitman, Dickinson, Twain, Chopin, James, Wharton, Dreiser, Norris, and Crane who are seen to accommodate the sense of danger, doubt, and disorder of the time. 4 lectures. Crosslisted as ENGL/HNRS 341. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 342. The Literary Sources of the American Character: 1914-1956. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

The writers of the modern period and those of the early post-modern age, including writers marked by stylistic innovation and a willingness to challenge traditionally accepted standards. May include such writers as Hemingway, Fitzgerald, Stein, Hughes. 4 lectures. Crosslisted as ENGL/HNRS 342. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 343. Multiple Voices of Contemporary American Literature. 4 units

GE Area C4; GWR

Term Typically Offered: W

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

In-depth study of American fiction, poetry, and drama written since 1956. How contemporary literature examines enduring American themes and breaks new ground with the inclusion of diverse voices. 4 lectures. Crosslisted as ENGL/HNRS 343. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 345. Women Writers of the Twentieth Century. 4 units

GE Area C4; GWR; USCP

Term Typically Offered: W

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

In-depth exploration of works of 20th century women authors within their historical and cultural contexts. Analysis of canonical and non-canonical writing by women of differing classes, races, ethnicities, and sexual preferences. Literary techniques through which texts reflect or challenge such cultural constructs as gender, identity, sexuality, motherhood, etc. The emergence of a female literary tradition. May include such writers as Woolf, Rich, Kingston, Yamamoto, Morrison, Cervantes. 4 lectures. Crosslisted as ENGL/HNRS 345. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

ENGL 346. Ethnic American Literature. 4 units

GE Area C4; GWR; USCP

Term Typically Offered: W

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Investigation of the primary issues, themes, and tropes of literature written in English by African-American, Asian-American, Native American, Hispanic and Jewish writers. Cultural and historical contexts explored to consider effects of marginalization on this literature, and its subsequent relation to the American canon. 4 lectures. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

ENGL 347. African American Literature. 4 units

GE Area C4; GWR; USCP

Term Typically Offered: F, W

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

The writings of African Americans from the end of the eighteenth century to the present. Individual works and literary trends among African Americans of various periods and contexts: intellectual, political, and cultural. 4 lectures. Crosslisted as ENGL/HNRS 347. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

ENGL 349. Gender in Twentieth Century Literature. 4 units

GE Area C4; GWR; USCP

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

In-depth study of issues related to male and female identity and the relations between men and women as depicted in twentieth-century fiction, poetry, non-fiction, and/or drama. How gender issues are created and viewed from different perspectives, such as social/economic class, ethnicity, and sexual orientation. 4 lectures. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

ENGL 350. The Modern Novel. 4 units

GE Area C4; GWR

Term Typically Offered: W

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Readings in the modern novel in its historical and cultural context. 4 lectures. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 351. Modern Poetry. 4 units

GE Area C4; GWR

Term Typically Offered: F, SP

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Modern poetry, considered in its historical and cultural context. The rise of experimental styles designed to reflect the disorder of the twentieth century - fragmentation, alienation, dislocation, and the absence of connections. 4 lectures. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 352. Modern Drama. 4 units

GE Area C4; GWR

Term Typically Offered: F

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Reading and analysis of world drama of the last 150 years, thereby enhancing student awareness of modern culture, history, ethics, politics, and the human condition. Design work, multi-media forms, art, music, and cinema as components or informing elements of the works under consideration. 4 lectures. Crosslisted as ENGL/HNRS 352. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 354. The Bible as Literature and in Literature and the Arts. 4 units

GE Area C4; GWR

Term Typically Offered: F

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

The most important and representative books of the Bible. Exposure to works based on the Bible in literature, painting, sculpture, architecture, music, and film. 4 lectures. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 360. Literature for Adolescents. 4 units

Term Typically Offered: TBD

Prerequisite: one of the following: ENGL 230, ENGL 231, ENGL 240, ENGL 241, ENGL 242, ENGL 251, ENGL 252, or ENGL 253. Recommended: Junior standing.

Analysis and evaluation of young adult literature appropriate for classroom instruction in grades 6-12 with special attention to the relationship of young adult literature to popular culture and themes relevant to adolescents. Pedagogical approaches also explored. Twenty hours of fieldwork in secondary schools required. 3 lectures, 1 activity.

ENGL 361. Reading Instruction for the Teaching of Young Adult Literature. 5 units

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A1 with a grade of C- or better; and completion of GE Area C1. Recommended: EDUC 300.

Analysis and evaluation of young adult literature appropriate for classroom instruction in grades 6-12. Special attention paid to metacognitive strategies of making sense of text with an emphasis on pedagogical approaches. Twenty hours of fieldwork in secondary schools required. Participation in public schools requires mandated fingerprint clearance. 4 lectures, 1 activity.

ENGL 365. Complexities of Literacy in Literature and Non-fiction Text. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing; and completion of GE Area A with a grade of C- or better.

Cognitive elements of reading and writing processes decoding and encoding, construction of meaning, recognizing and using text conventions of different genres. Metacognitive strategies for making sense of text. Twenty hours of fieldwork in secondary schools required. 3 lectures, 1 activity.

ENGL 368. Theory and Practice of Peer-to-Peer Writing Instruction. 4 units

Term Typically Offered: F, W

Prerequisite: Junior standing; completion of GE C1 with a grade of 'B' or better, or consent of instructor.

Discussion and application of theories and practices central to writing center work, such as collaborative learning, the writing process, social dimensions of the peer/tutor relationship, and strategies for working with specific student populations including second-language writers and writers from across the disciplines. Required for those interested in becoming tutors in the University Writing and Rhetoric Center and/or new teaching assistants in English. 3 lectures, 1 activity.

ENGL 370. World Cinema. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and GE Area C1.

Major works of international cinema with emphasis on critical interpretation, on the ways film communicates visually and aurally, and on the historical and cultural contexts in which films are created. 3 lectures, 1 laboratory. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 371. Film Styles and Genres. 4 units

GE Area C4; GWR

Term Typically Offered: W

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Major films within particular cinematic genres or styles, with emphasis on critical interpretation, aesthetic appreciation, and the films' historical and cultural contexts. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 372. Film Directors. 4 units

GE Area C4; GWR

Term Typically Offered: F, SP

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Films of one or more major film directors, with emphasis on critical interpretation, aesthetic appreciation, and the films' historical and cultural contexts. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 380. Literary Themes. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Literature selected according to a particular theme. Emphasis on critical interpretation, aesthetic appreciation, and historical and cultural contexts. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Crosslisted as ENGL/HNRS 380. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

ENGL 381. Diversity in Twentieth-Century American Literature. 4 units

GE Area C4; GWR; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Literature selected according to a particular theme, with a focus on issues of ethnicity and gender. Emphasis on critical interpretation, aesthetic appreciation, and historical and cultural contexts. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

ENGL 382. LGBT Literature and Media. 4 units

GE Area C4; GWR; USCP

Term Typically Offered: W

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Representations of lesbian, gay, bisexual, transgendered (LGBT) individuals and issues, late 19th century to the present. Topics include the closet, homophobia, coming out, AIDS, same-sex marriage, intersections of sexuality, race, class, gender identity. 4 lectures. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

ENGL 386. Creative Nonfiction. 4 units

GE Area C4

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Writing creative nonfiction (the memoir, the nature essay, the personal narrative, cultural criticism, literary journalism) by adding composition skills of fictional and poetic techniques. A publication workshop. Total credit limited to 8 units. 4 lectures. Fulfills GE C4 except for English majors.

ENGL 387. Fiction Writing. 4 units

GE Area C4

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

How to write and read fiction. Exploring and understanding the elements of fiction writing, employing models by established writers. Total credit limited to 8 units. 4 lectures. Fulfills GE C4 except for English majors.

ENGL 388. Poetry Writing. 4 units

GE Area C4

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

How to write and read poetry. Exploring a variety of formal options, employing model poems by established writers and identifying and enhancing what is best in poetry written in class. Total credit limited to 8 units. 4 lectures. Fulfills GE C4 except for English majors.

ENGL 390. The Linguistic Structure of Modern English. 4 units

Term Typically Offered: SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

Linguistic analysis of the English language, including phonology, morphology, syntax, and style and dialect variation. 4 lectures.

ENGL 391. Topics in Applied Linguistics. 4 units

Term Typically Offered: W, SP

Prerequisite: Junior standing and completion of GE Area A with a grade of C- or better.

Topics in applied linguistics including sociolinguistics, first and second language acquisition, literacy, bilingualism, and dialectology. Applications to teaching the English language. 4 lectures.

ENGL 395. History of the English Language. 4 units

Term Typically Offered: W

Prerequisite: Completion of GE Area A with a grade of C- or better.

Linguistic approach to the history of the English language: evolution of phonology, morphology, lexicon, syntax, and semantics within the changing cultural context of the last 2000 years. 4 lectures.

ENGL 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of the department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units.

ENGL 408. Internship. 2-12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Advanced study and part-time work experience; current innovation, practices, and problems in administration, supervision, and organization. Must be able to do independent work in career field. Weekly reports and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only.

ENGL 411. New Media Arts I. 4 units

Term Typically Offered: F

Prerequisite: Junior standing; and completion of GE Area A with a grade of C- or better.

Advanced-level presentation of new media theory, design and practice. Topics covered include, but are not limited to, interactivity theory, user-centered system design, cognitive psychology, media analysis, and basic web design theory. Total credit limited to 8 units. 4 lectures. Crosslisted as ENGL/HNRS 411.

ENGL 412. New Media Arts II. 4 units

Term Typically Offered: TBD

Prerequisite: ENGL 411.

Advanced level of work with the primary technologies and design/critique theories currently at use in the professional creation of new media works. Lectures and readings expand upon material presented in ENGL 411. 4 lectures. Crosslisted as ENGL/HNRS 412.

ENGL 421. Advanced Topics in Technical and Professional Communication. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing; ENGL 221; and either ENGL 317 or ENGL 319.

Advanced inquiry into themes, genres, or applications of technical and professional communication. Required for Technical and Professional Communication Certificate Program. The Schedule of Classes will list title selected. Total credit limited to 12 units. 4 seminars.

ENGL 424. Teaching English in Secondary Schools. 5 units

Term Typically Offered: F

Prerequisite: Completion of GE Area A with a grade of C- or better; and Senior or graduate standing and admission to the teacher education program.

Research-based methods of teaching English in secondary schools, with emphasis on practical approaches to teaching grammar/mechanics and the writing process in a literature-based classroom. Attention to lesson and unit planning and integration of state standards and technology. 5 lectures.

ENGL 425. English Clinical Experience Seminar. 2 units

CR/NC

Term Typically Offered: W, SP

Prerequisite: Acceptance into the Single Subject Credential Program in English. Concurrent: EDUC 469 or EDUC 479.

Principles and practices in effective teaching of English at the middle and high school level, learning theories, curriculum content and structure, classroom issues, and the teaching profession. Credit/No Credit grading only. Total credit limited to 4 units. 2 seminars.

ENGL 430. Chaucer. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing and two of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305. Recommended: ENGL 203.

Selected readings from Canterbury Tales and Chaucer's other major poems. 4 seminars.

ENGL 431. Shakespeare. 4 units

Term Typically Offered: F

Prerequisite: Junior standing and two of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305. Recommended: ENGL 204.

Representative comedies, tragedies, and histories. 4 seminars.

ENGL 432. Milton. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing and two of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305. Recommended: ENGL 204.

Paradise Lost, Paradise Regained, and Samson Agonistes, with some attention to the minor poems. 4 seminars.

ENGL 439. Significant British Writers. 4 units

Term Typically Offered: F

Prerequisite: Junior standing and two of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305. Recommended: English Major CORE class in the relevant period.

Selected British writers, as individual writers or in groups. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars.

ENGL 449. Significant American Writers. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and two of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305. Recommended: English Major CORE class in the relevant period.

Selected American writers, as individual writers or in groups. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars.

ENGL 459. Significant World Writers. 4 units

Term Typically Offered: W, SP

Prerequisite: Junior standing and two of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305. Recommended: English Major CORE class in the relevant period.

Selected world writers as individual writers or in groups. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars.

ENGL 461. Senior Project. 4 units

Term Typically Offered: F, SP

Prerequisite: Senior standing; completion of the GWR; four of the following: ENGL 203, ENGL 204, ENGL 205, ENGL 303, ENGL 304, ENGL 305; and three of the following: ENGL 430, ENGL 431, ENGL 432, ENGL 439, ENGL 449, ENGL 459.

Capstone course which must be taken during the last two quarters of the student's undergraduate career.

ENGL 467. Topics in Rhetoric and Writing. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area C4.

The study of rhetorical concepts and theories. Rhetorical analysis of various historical and contemporary texts – including social, cultural and technological genres, compositions, and performances – to understand how they communicate and persuade. Field trip may be required. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars.

ENGL 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ENGL 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 12 units. Credit/No Credit grading only.

ENGL 486. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 8 units; total credit limited to 12 units. Credit/No Credit grading only.

ENGL 487. Advanced Creative Writing: Fiction. 4 units

Term Typically Offered: F, W

Prerequisite: ENGL 387.

Instruction and practice in advanced writing, revising and evaluating of fiction. Total credit limited to 8 units. 4 lectures.

ENGL 488. Advanced Creative Writing: Poetry. 4 units

Term Typically Offered: F, W

Prerequisite: ENGL 388.

Instruction and practice in advanced writing, revising and evaluating of poetry. Total credit limited to 8 units. 4 lectures.

ENGL 495. Topics in Applied Language Study. 4 units

Term Typically Offered: F

Prerequisite: ENGL 290 or ENGL 390.

Application of linguistics to human communications, human relations, and language policy and planning, or literature. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars.

ENGL 497. Theories of Language Learning and Teaching. 4 units

Term Typically Offered: F

Prerequisite: Two of the following: ENGL 290, ENGL 390, ENGL 391, ENGL 395, ENGL 495.

Theories of first and second language learning and acquisition in the context of teaching English as a second language/dialect. 4 lectures.

ENGL 498. Approaches to Teaching English as a Second Language/Dialect. 4 units

Term Typically Offered: W

Prerequisite: ENGL 497.

Approaches to teaching English as a second language. Attention to materials development and testing. 4 lectures.

ENGL 499. Practicum in Teaching English as a Second Language/Dialect. 2 units

CR/NC

Term Typically Offered: SP

Prerequisite: ENGL 498.

Practical experience in the English as a second language classroom under supervision of a cooperating teacher. Teaching materials development and curriculum design. Credit/No Credit grading only. 1 seminar and supervised work.

ENGL 501. Introduction to English Studies. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing in English.

Purposes and methods of research in English studies, including literature, linguistics, rhetoric, and composition. Acquaintance with printed and on-line materials of research and practical experience in collecting material, weighing evidence, reaching conclusions, and writing scholarly articles. Discussion of areas of disciplinary specialization and ethics of scholarship. 4 seminars.

ENGL 502. Seminar in Critical Analysis. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing in English.

Basic approaches used by critics. Multiple points of view. Application to literary works. Class Schedule will list topic selected. Total credit limited to 8 units. 4 seminars.

ENGL 503. Graduate Introduction to Linguistics. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in English.

Introduction to linguistics for graduate students. Phonology, morphology lexicon, syntax, and variation within language; application of linguistics to real-world issues. 4 seminars.

ENGL 505. Composition Theory. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing in English.

Special problems in composition. Direct application of composition and rhetorical theory to composition instruction. 4 seminars.

ENGL 506. Pedagogical Approaches to Composition. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in English and ENGL 505, or consent of instructor. Concurrent: Teaching of ENGL 134.

Practical problems in the teaching of English composition. Application and study of practical approaches. Discussion of classroom organization and management. Discussion of research into the nature and resolution of student writing problems. Required of all new teaching assistants in English. 4 seminars.

ENGL 510. Seminar in Authors. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing in English. Recommended: ENGL 501.

Intensive study of major British and American literary figures, singly, doubly or in small groups. Written and oral reports of individual investigation. Class Schedule will list topic selected. Total credit limited to 16 units. 4 seminars.

ENGL 511. Seminar in American Literary Periods. 4 units

Term Typically Offered: F, SP

Prerequisite: Graduate standing in English. Recommended: ENGL 501.

American periods. Written and oral reports of individual investigation. The Schedule of Classes will list topic selected. Total credit limited to 20 units. 4 seminars.

ENGL 512. British Literary Periods. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing in English. Recommended: ENGL 501.

British periods. Written and oral reports of individual investigation. Class Schedule will list topic selected. Total credit limited to 20 units. 4 seminars.

ENGL 513. Seminar in Special Topics. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in English. Recommended: ENGL 501.

Themes and ideas in language and literature not ordinarily covered in the routine graduate course offerings. Written and oral reports of individual investigation. Class Schedule will list topic selected. Total credit limited to 16 units. 4 seminars.

ENGL 515. Apprenticeship in Teaching Literature, Composition, or Linguistics at College Level. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing in English and 8 units of successful graduate work.

Supervised experience in planning, teaching, and evaluating a 100-, 200- or 300-level linguistics, composition, or literature class taught by English faculty member. Planning, selecting texts, conferring with students, discussing and constructing assignments, lecturing, leading small group discussions. Credit/No Credit grading only. Total credit limited to 8 units.

ENGL 518. Graduate Technical Communication. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Introduction to technical communication scholarship for graduate students. Addresses usability, visual theory, information design, technical editing, and writing for professional and public audiences. Analysis and critique of technical communication documents. 4 seminars.

ENGL 519. Seminar in Rhetoric and Writing. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in English; and ENGL 505.

Themes and ideas in rhetoric and composition not ordinarily covered in the routine graduate course offerings. Written and oral reports of individual investigation. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars.

ENGL 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 4 lectures.

ENGL 590. Directed Study. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in English and the permission of the graduate advisor.

Supervised independent or group study of special problems in selected areas of language, composition, or literature. Total credit limited to 12 units.

ENGL 598. Graduate Project. 2 units

Term Typically Offered: F, SP

Prerequisite: Consent of graduate advisor; ENGL 501; ENGL 502; ENGL 503; and ENGL 505.

Development, revision, and conclusion of a portfolio of graduate writing in literary criticism, linguistics, rhetoric, and/or composition. Students engage in research and present their completed projects to the graduate advisor. To be taken in the final term of the graduate program. 2 seminars.

Environmental Design (EDES)

EDES Courses

EDES 101. Introduction to Architecture and Environmental Design. 2 units

Term Typically Offered: TBD

Familiarization with the professional fields of architecture, landscape architecture, structural engineering, construction, and city planning.

Introduction to the college's programs as they relate to individual aptitudes. The design process. Visiting speakers. 2 lectures.

EDES 123. Principles of Environmental Design. 4 units

GE Area D4

Term Typically Offered: F, W, SP

Recommended: Previous or concurrent enrollment in ARCH 131 for ARCH majors.

Introduction to the individual's and societal relation with the designed and built environment, and its impact on natural resource consumption, identity, behavior, community, and human health, safety, and general well-being. Study of the individual and role of design in community development and in making and preserving culture. Diverse perspectives including designers, engineers, governing bodies, and individual users. 2 lectures, 2 discussions. Fulfills GE D4.

EDES 333. Professional Presentations. 4 units

Term Typically Offered: TBD

Prerequisite: Third-year standing or permission of instructor.

Skills and tools for employment acquisition or graduate school admissions. Individual resume design and production. Documentation of personal, professional and academic experience via written, oral and image based systems. Employment interview dynamics. Electronic and hardcopy portfolio production. Internet marketing. 1 lecture, 3 activities.

EDES 350. The Global Environment. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area B.

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/ historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 4 lectures. Crosslisted as AG/EDES/ENGR/GEOG/ISLA/SCM/UNIV 350. Fulfills GE Area F.

EDES 406. Sustainable Environments. 4 units

Term Typically Offered: F

Prerequisite: Fourth year or graduate standing.

Collaboration of interdisciplinary faculty and guest speakers/panelists. Introduction, illustration and analysis of concepts and principles for sustainability to be used in all aspects of environmental design. Integration and application of knowledge of human and natural systems with environmental, social and economic concerns, from a global-to-local perspective. 4 lectures.

EDES 408. Implementing Sustainable Principles. 4 units

Term Typically Offered: W, SP

Prerequisite: EDES 406.

A primarily project-based course, intended to aid students who wish to collaborate with the purpose of implementing sustainability principles by developing tools, process or designs, for community-based projects and proposals at various scales of planning, architecture and design of the human environment to address social, environmental and economic issues. 4 lectures.

EDES 410. Advanced Implementation of Sustainable Principles. 4 units

Term Typically Offered: W, SP

Prerequisite: EDES 408.

Advanced continuation of community-based projects defined and initiated in EDES 408. Ongoing projects, individual and group, address variable scales of planning, architecture, and environmental design, with required completion at the end of the course. 2 seminars and supervised work.

Environmental Engineering (ENVE)

ENVE Courses

ENVE 111. Introduction to the Environmental Engineering Profession. 1 unit

CR/NC

Term Typically Offered: F

Introduction to the Environmental Engineering Program including course planning, opportunities for global and regional problems such as water quality, waste management, and sustainability. Credit/No Credit grading only. 1 lecture.

ENVE 264. Environmental Fluid Mechanics. 4 units

Term Typically Offered: F

Prerequisite: MATH 241, PHYS 132, and ME 211.

Theory and application of fluid statics and fluid dynamics to environmental problems in air and water systems. Fluid properties, pressure within stationary and moving systems, fluid momentum, pipe and channel flow including Bernoulli's Equation and friction effects, flow measurement systems. 4 lectures.

ENVE 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ENVE 304. Process Thermodynamics. 3 units

Term Typically Offered: W

Corequisite: CHEM 125 or CHEM 129; ENVE 331.

First and second laws of thermodynamics, properties of gases, liquids and mixtures, vapor-liquid equilibria, solubility and absorption, equilibrium in chemical reactions, thermodynamic applications in environmental engineering. 3 lectures.

ENVE 309. Noise and Vibration Control. 3 units

Term Typically Offered: W

Prerequisite: MATH 241 and PHYS 132. Corequisite: ENGL 149.

Impact of noise and methods for noise reduction in industrial environments. Behavior of sound waves, selection of instrumentation, practical measurements, criteria for noise and vibration control. Laboratory and field measurements to investigate the basic principles of sound propagation and control. Assessment of noise produced by transportation and other engineering facilities. 2 lectures, 1 laboratory.

ENVE 323. Engineering for the Environment. 4 units

GE Area F

Term Typically Offered: F

Prerequisite: Junior standing and completion of GE Area B.

Societal importance of air quality, water quality and land resources. Technologies used to control air and water pollution and the scientific basis for these technologies. Use of mass balances to understand pollutant transport and treatment. Local examples of the application of pollution control technologies to meet legal requirements. Not for engineering majors. 4 lectures. Fulfills GE Area F.

ENVE 324. Introduction to Air Pollution. 4 units

GE Area F

Term Typically Offered: W, SP

Prerequisite: Junior standing and completion of GE Area B.

Causes and effects of air pollution on the individual, the community and industry. Application of mathematics and chemistry to solve air pollution problems. For non-majors. 4 lectures. Fulfills GE Area F.

ENVE 325. Air Quality Engineering. 4 units

Term Typically Offered: SP

Prerequisite: CHEM 125 or CHEM 128.

Causes and effects of air pollution on individual, regional, and global scales including meteorology, pollutant chemistry, global and regional transport, health impacts, regulations, air pollution control technology, and global climate change. Engineering principles to understand, model, and predict air quality. 4 lectures.

ENVE 331. Introduction to Environmental Engineering. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CHEM 125 or CHEM 128, MATH 242 or MATH 244 (or concurrent).

Description and quantification of water and air quality characteristics important for water and wastewater treatment and air pollution control. Fundamentals of kinetics, reactor configurations, toxicity and dose-response relationship. Regulations governing ambient pollutant levels and discharges. Introduction to the modeling of pollutant fate and transport. Overview of solid waste management and global environmental issues. 4 lectures.

ENVE 400. Special Problems. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

ENVE 405. Environmental Engineering Research. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of instructor. Recommended: Prior or concurrent enrollment in ENVE 434 and ENVE 438.

Participation in environmental engineering research projects with emphasis on professional safety procedures for lab and field work and data quality assurance/quality control. Research projects focus on developing technologies or techniques that improve the sustainability of environmental engineering infrastructure. Total credit limited to 8 units; technical elective credit limited to 4 units. 1 laboratory.

ENVE 407. Environmental Engineering Design Competition. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: consent of instructor. Recommended: ENVE 331.

Design, build, test, and present a solution to an environmental problem posed by a student design competition. 1 laboratory. Total credit limited to 4 units.

ENVE 411. Air Pollution Control. 4 units

Term Typically Offered: F

Prerequisite: CE 251 or CSC 231; ENVE 304 or ME 302; ENVE 264 or ME 341; ENVE 325; and ENVE 331.

Theory, principles, and practices related to the control of particulate and gaseous emissions. Mechanical and chemical separations. Cost and design of control systems. 4 lectures.

ENVE 421. Mass Transfer Operations. 4 units

Term Typically Offered: SP

Prerequisite: ENVE 325, ENVE 331, ENVE 304 or ME 302, ENVE 264 or ME 341.

Theory of mass transfer principles applied to environmental problems. Diffusion and dispersion modeling of contaminant transport. Design principles of scrubbers, absorbers, and membrane systems for air and water pollution control. 4 lectures.

ENVE 426. Air Quality Measurements. 3 units

Term Typically Offered: SP

Prerequisite: ENVE 325, CHEM 212/312, ENVE 264 or ME 341, STAT 312, and ENGL 149.

Planning and conducting air quality measurements in the atmosphere, indoors and at the source. Topics include quality control, calibration, and instrument operation for particulate matter, gas and meteorological measurements. 2 lectures, 1 laboratory.

ENVE 434. Water Chemistry and Water Quality Measurements. 4 units

Term Typically Offered: W

Prerequisite: CHEM 125 or CHEM 129, ENVE 330 or ENVE 331.

Aquatic environmental chemistry and water quality measurements. Equilibrium chemistry, carbonate systems, redox reactions, and electrochemistry. Laboratories include topics such as measurement of suspended solids, turbidity, alkalinity, BOD, and coliform detection. Quality analysis and control. 3 lectures, 1 laboratory.

ENVE 436. Introduction to Hazardous Waste Management. 4 units

Term Typically Offered: W

Prerequisite: ENVE 325 and ENVE 331.

Overview of hazardous waste generation, federal and state regulations, storage, transport, treatment, and remediation. Principles of toxicology, unit operations and processes for the treatment, reduction, and remediation of wastes. Ultimate disposal including incineration, solidification, and bioremediation 4 lectures.

ENVE 438. Water and Wastewater Treatment Design. 3 units

Term Typically Offered: F, SP

Prerequisite: ENVE 331 and ME 341 or ENVE 264.

Theory and design of facilities for physical and chemical treatment of water and wastewater, biological treatment of wastewater, and treatment and disposal of sludge. 3 lectures.

ENVE 439. Sustainable Solid Waste Engineering. 4 units

Term Typically Offered: W

Prerequisite: ENVE 325 and ENVE 331; or graduate standing.

Design and analysis of recycling, composting, anaerobic digestion, gasification, and combustion systems for the recovery of resources and energy from solid wastes. Field trips required. 3 lectures, 1 laboratory.

ENVE 443. Bioremediation Engineering. 4 units

Term Typically Offered: SP

Prerequisite: ENVE 331.

State-of-the-art bioremediation technologies for soil, groundwater and contaminated air stream remediation and pollution prevention. Introduction to engineering design combining biogenetics, reactor configuration, and basic biological and engineering principles. Various in-situ and ex-situ technologies. Field trip may be required. 3 lectures, 1 laboratory.

ENVE 450. Industrial Pollution Prevention. 4 units

Term Typically Offered: SP

Prerequisite: ENVE 331.

Theory and case studies of innovative industrial waste minimization and resource conservation through principles of pollution prevention. Life-cycle assessment, pollution prevention, economic analysis, and sustainable designs. 3 lectures, 1 laboratory.

ENVE 455. Environmental Health and Safety. 4 units

Term Typically Offered: SP

Prerequisite: ENVE 331.

Physical, chemical and biological hazards associated with industrial processes. Toxicology. Safety analysis and design. Causes and prevention of occupational and environmental hazards. Development and implementation of industrial hygiene programs. 4 lectures.

ENVE 466. Senior Project Design Laboratory I. 2 units

Term Typically Offered: F

Prerequisite: ENVE 438 and senior standing. Corequisite: CE 336.

Recommended: CE 465.

Capstone team project on a complex, integrated design problem typical of the environmental engineering profession. Formal reports and presentations are prepared. Non-technical issues addressed: ethics, teamwork, leadership, communication, and professional practice. 2 laboratories.

ENVE 467. Senior Project Design Laboratory II. 2 units

Term Typically Offered: W

Prerequisite: ENVE 466.

Continuation of ENVE 466. Continuation of capstone project by individuals or teams with submission of final reports and presentations 2 laboratories.

ENVE 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

ENVE 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

ENVE 480. Environmental Engineering of Energy. 4 units

Term Typically Offered: F

Prerequisite: ENVE 304 or ME 302; ENVE 331. Recommended: ENVE 325.

Environmental impacts of conventional and renewable energy production and of emerging renewable energy development. Environmental engineering methods for mitigation of impacts of fossil fuel processing, including hydrofracking. Greenhouse gas inventory and management. Field trips required. 3 lectures, 1 laboratory.

ENVE 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

ENVE 500. Individual Study. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of department chair.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units.

ENVE 525. Indoor Air Quality Engineering. 4 units

Term Typically Offered: W

Prerequisite: ENVE 264 or ME 341; senior or graduate standing.

Recommended: ENVE 325.

Pollutants sources and sinks indoors, transport processes, ventilation, and engineering controls. Human factors and engineering factors that influence the quality of the indoor environment. 4 lectures.

ENVE 535. Physico-Chemical Water and Wastewater Treatment. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Physical and chemical processes used in potable water treatment and advanced wastewater treatment. Coagulation, flocculation, sedimentation, filtration, membrane separation, disinfection, and absorption. Wastewater recycling regulations. Integration of treatment processes. 4 lectures.

ENVE 536. Biological Wastewater Treatment Processes Engineering. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing or consent of instructor.

Fundamentals of biological wastewater treatment. Suspended and attached growth bioreactors. Activated sludge, biotower, and anaerobic process design. Biological nutrient removal. 4 lectures.

ENVE 537. Decentralized Wastewater Management. 4 units

Term Typically Offered: SP

Prerequisite: ENVE 438 or Graduate standing.

Design and management of decentralized wastewater treatment systems. Septic tanks, aerobic nutrient removal systems, ponds, constructed wetlands, and improved latrines; surface and subsurface effluent recycling or disposal; and septage management. 4 lectures.

ENVE 542. Sustainable Environmental Engineering. 4 units

Term Typically Offered: F

Prerequisite: Graduate or senior standing or consent of instructor.

Critical analysis of environmental engineering practices such as solid waste management, recycling, and wastewater treatment from the viewpoint of energy efficiency, lifecycle cost, and sustainability. Both laboratory experiments and computer models to assess sustainability. 3 lectures, 1 laboratory.

ENVE 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 seminars.

ENVE 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

ENVE 581. Biochemical Engineering. 4 units

Term Typically Offered: F

Prerequisite: CHEM 312 and MCRO 221.

Types of microorganisms and microbially-mediated biochemical reactions for biotechnology applications. Stoichiometric and thermodynamic principles for microbial growth and metabolism. Material and energy balances for aerobic and anaerobic growth and bioreactor design. Kinetics of enzyme catalyzed reactions. Field trips required. 3 seminars, 1 laboratory. Crosslisted as ENGR/ENVE 581.

ENVE 599. Design Project (Thesis). 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing.

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis.

Ethnic Studies (ES)

ES Courses

ES 112. Race, Culture and Politics in the United States. 4 units

GE Area D1; USCP

Term Typically Offered: F, W, SP

Introductory and interdisciplinary study of the ways that race and ethnicity are created by both historical processes and American institutional formation - specifically social, political, economic, legal and cultural institutions. Special attention paid to the interlocking systems of race, class, gender and sexuality. 4 lectures. Crosslisted as ES/HNRS 112. Fulfills GE D1 and USCP.

ES 114. Introduction to Ethnic Studies: Race in the United States. 4 units USCP

Term Typically Offered: W

Racial equality movements, including the history of Ethnic Studies (1960's & 70's), and the social practices, institutions, cultural representations/discourses, and public policies that construct and reinforce racism, racist ideology, and pseudo-scientific conceptions of race and intersections with gender and class. 4 lectures. Fulfills USCP.

ES 200. Special Problems. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 4 units.

ES 212. Global Origins of United States Cultures. 4 units

GE Area D3; USCP

Term Typically Offered: TBD

How the global dispersal of Europeans, Asians, and Africans, the hemispheric dispersal of Latin Americans, and the forced internal migration of Native Americans have contributed to American cultural heritage and the struggles for ethnic, class and gender equality, and justice. 4 lectures. Crosslisted as ES/HNRS 212. Fulfills GE D3 and USCP.

ES 215. Planning for and with Multiple Publics. 4 units

USCP

Term Typically Offered: TBD

Prerequisite: Completion of GE Area D1. Recommended: ES 112.

How the social/spatial relationships among racial/ethnic and gender groups are expressed in terms of human settlement patterns, civic involvement and everyday negotiations. Ways in which segregation and marginalization are expressed in western and non-western contexts. 4 lectures. Crosslisted as CRP/ES 215. Fulfills USCP.

ES 241. Survey of Indigenous Studies. 4 units

GE Area D3; USCP

Term Typically Offered: F, W, SP

A survey of the interdisciplinary field of indigenous studies and specifically the social, political, economic, legal, and cultural institutions of American Indian, Native Alaskan, and Native Hawaiian peoples within a transnational and global context. Special attention paid to the interlocking systems of race, class, gender, and sexuality, particularly within but not limited to the United States. 4 lectures. Fulfills GE D3 and USCP.

ES 242. Survey of Africana Studies. 4 units

GE Area D3; USCP

Term Typically Offered: F, W, SP

A survey of the interdisciplinary field of Africana Studies and specifically the social, political, economic, legal, and cultural institutions of African American, Afro-Caribbean, and African diasporic peoples within a transnational and global context. Special attention paid to the interlocking systems of race, class, gender, and sexuality, particularly within but not limited to the United States. 4 lectures. Fulfills GE D3 and USCP.

ES 243. Survey of Latino/a Studies. 4 units

GE Area D3; USCP

Term Typically Offered: F, W, SP

A survey of the interdisciplinary field of Latino/a Studies and specifically the social, political, economic, legal, and cultural institutions of Chicano/a and other Latino/a peoples within a transnational and global context. Special attention paid to the interlocking systems of race, class, gender, and sexuality, particularly within but not limited to the United States. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE D3 and USCP.

ES 244. Survey of Asian American Studies. 4 units

GE Area D3; USCP

Term Typically Offered: F, W, SP

A survey of the interdisciplinary field of Asian American Studies and specifically the social, political, economic, legal, and cultural institutions of West Asian, South Asian, Southeast Asian, and East Asian peoples in the United States within a transnational and global context. Special attention paid to the interlocking systems of race, class, gender, and sexuality, particularly within but not limited to the United States. 4 lectures. Fulfills GE D3 and USCP.

ES 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ES 300. Chicano/a Non-Fiction Literature. 4 units

GE Area C4; USCP

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Overview of contemporary Chicano/a non-fiction literature since 1848. Thematic concerns, literary criticism, literary techniques, historical and socio-cultural factors influencing non-fiction Chicano/a literary genres. Instructor reserves option to select non-fiction genres to be studied. 4 lectures. Fulfills GE C4 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 308. Fire and Society. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A3 with a grade of C- or better; and one lower division course in GE Area D.

Prehistorical and historical record of human use of and attitude toward fire. Mythology and religion of fire. Traditional, cultural and ethnic variations and their influence on modern U.S. institutions involved in managing fire. 3 lectures, 1 activity. Crosslisted as ES/NR 308. Fulfills GE D5.

ES 310. Hip-Hop, Poetics and Politics. 4 units

GE Area D5; USCP

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area D. Recommended: ES 112 (D1) or any ES D3 course.

Dynamics of hip-hop culture, its historical development, political significance, and social influence. How hip-hop exemplifies cross-cultural hybridization within not only Black communities nationally and internationally, but also amongst indigenous, Latino/a, and Asian peoples in the U.S. and beyond. 4 lectures. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 320. African American Cultural Images. 4 units

GE Area D5; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area D. Recommended: ES 112 (D1) or any ES D3 course.

Comparative study of the cultural representations of, and counter-representations by, American racial/ethnic groups in American popular opinion and consciousness, with particular emphasis on African Americans. 4 lectures. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 321. Native American Cultural Images. 4 units

GE Area D5; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area D. Recommended: ES 112 (D1) or any ES D3 course.

Comparative study of the cultural representations of, and counter-representations by racial/ethnic groups in American popular opinion and consciousness, with particular emphasis on Native Americans. The cultural images of Native peoples in the United States that have characterized relationships. 4 lectures. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 322. Asian American Cultural Images. 4 units

GE Area D5; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area D. Recommended: ES 112 (D1) or any ES D3 course.

Comparative study of the cultural representations of, and counter-representations by, American racial/ethnic groups in American popular opinion and consciousness, with particular emphasis on Asian-Americans. 4 lectures. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 323. Mexican American Cultural Images. 4 units

GE Area D5; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area D. Recommended: ES 112 (D1) or any ES D3 course.

Comparative study of the cultural representations (racializing images and discourses) of, and counter-representations by, American cultural/ethnic groups in American popular opinion and consciousness, with particular emphasis on Mexican Americans/Latinos. 4 lectures. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 325. Sexuality and Gender in African American Communities. 4 units

USCP

Term Typically Offered: TBD

Prerequisite: Completion of a course in GE Area D1 or D3. Recommended: ES 112 or ES 212.

Gender and sexuality issues that influence the social, political, economic and cultural development of African-America. Special attention given to how racism affects the realization of standard gender conventions within black communities, as well as to myths of black sexuality, black feminism, and queer politics. 4 lectures. Fulfills USCP.

ES 326. Native American Architecture and Place. 4 units

GE Area C4; USCP

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

The role of culture and setting in the construction of spatial, material and landscape concepts and artifacts, through the introduction of selected North American cultures, with focus from 1300 AD through contemporary time. 4 lectures. Crosslisted as ARCH/ES 326. Fulfills GE C4. Fulfills USCP.

ES 330. The Chinese American Experience. 4 units

GE Area D5; USCP

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area D. Recommended: ES 112 (D1) or any ES D3 course.

History and current status of Chinese Americans, with emphasis on the international contexts, organizations and institutions of Chinese America, and on Chinese Americans' demographic compositions, spatial patterns, and cultural, socioeconomic, and political adaptation experiences. 4 lectures. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 335. The Filipina/o American Experience. 4 units

GE Area D5; USCP

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area D. Recommended: ES 112 (D1) or any ES D3 course.

An interdisciplinary examination of the historical development of Filipina/o American identities and communities. The social, cultural and political institutions that have influenced Filipina/o immigration, participatory citizenship, activism and cultural practices. 4 lectures. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 340. Cultural Production and Ethnicity. 4 units

GE Area C4

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area C. Recommended: Completion of one ES course.

Culture and ethnicity as key factors in the production, perception, and interpretation of art and the humanities. Critical analysis of cultural attitudes and knowledge in expressive arts and cultural production, and of the contexts of cultural production as reflective of ethnicity. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Fulfills GE C4 except for Comparative Ethnic Studies majors.

ES 345. Queer Ethnic Studies. 4 units

GE Area D5; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course from lower division Area D.

Theories, research and methods focused on the interlocking systems of sexuality, race, racialization, and ethnicity in local, national and comparative global/transnational contexts. Relationships between racialization and heteronormativity; queer of color critique; queer migration; decolonizing queer organizing, theory, and knowledge production. 4 lectures. Crosslisted as ES/WGS 345. Fulfills GE D5 except for Ethnic Studies majors. Fulfills USCP.

ES 350. Gender, Race, Culture, Science and Technology. 4 units

GE Area F; USCP

Term Typically Offered: F, W

Prerequisite: Junior standing; completion of GE Area B.

Interdisciplinary examination of the complex relationships between gender, race, culture, science, technology in educational, work, knowledge production, policy, and ethical contexts. Topics may include reproductive, medical, genetic, and emerging technologies and exploration of efforts to create more socially responsible science/technology. 3 lectures, 1 activity. Crosslisted as ES 350/HNRS 353/WGS 350. Fulfills GE Area F and USCP.

ES 351. Gender, Race, Class, Nation in Global Engineering, Technology & International Development. 4 units

GE Area D5

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area D.

Cross-cultural exploration of the intersections of gender, race, class, nation in the global engineering workforce, small- and large-scale technological systems, and international development programs; special attention to 21st century challenges and efforts to create more socially responsible engineering and technology. 4 lectures. Crosslisted as ES/WGS 351. Fulfills GE Area D5 except for Comparative Ethnic Studies majors.

ES 360. Ethnicity and the Land. 4 units

GE Area C4; USCP

Term Typically Offered: W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area C. Recommended: One lower division Ethnic Studies course and an introductory natural resources course.

Comparative study of how race and culture shape landscapes, and how social hierarchies allocate the use of natural resources and the burdens of environmental pollution. 4 lectures. Crosslisted as ES/NR 360. Fulfills GE C4 and USCP.

ES 380. Critical Race Theory. 4 units

GE Area D5; USCP

Term Typically Offered: W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area D1 or D3.

History and evolution of the critical race theory movement. Defining issues of the field; in particular, the relationship between race, power and the law. 4 lectures. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 381. The Social Construction of Whiteness. 4 units

GE Area D5; USCP

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area D. Recommended: ES 112 (D1) or any ES D3 course.

The investigation of the social construction of race in the United States through historicizing the category of 'whiteness.' Why 'white' was invented as a racial category and how white privilege has been sustained through social, political, economic and legal practices. 4 lectures. Fulfills GE D5 except for Comparative Ethnic Studies majors. Fulfills USCP.

ES 390. Research Methodology in Comparative Ethnic Studies. 4 units

Term Typically Offered: F

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; STAT 217; ES 112; and three courses from ES 241, ES 242, ES 243, ES 244.

Theory and practice of research methodology in comparative ethnic studies. Topics include the scientific method, qualitative and quantitative methodologies, and ethical practices. Research report prepared from start to finish, including database searching, collecting pilot data, and proper formatting of a research report. Issues of race in research practice and use foregrounded throughout. 3 lectures, 1 activity.

ES 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of department chair.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units.

ES 406. Indigenous Peoples and International Law and Policy. 4 units

Term Typically Offered: TBD

Prerequisite: ES 241; and NR 141 or NR 142; and junior standing required.

Interdisciplinary examination of the evolution of international law effecting indigenous peoples in the U.S. and in the Americas. Development of international legal and sociological norms and their impact on human rights of indigenous peoples with particular attention to environmental issues. 4 lectures. Crosslisted as ES/NR 406.

ES 410. Advanced Topics in Comparative Ethnic Studies. 4 units

Term Typically Offered: TBD

Prerequisite: ES 390.

Selected topics and issues in comparative ethnic studies. Class Schedule will list topic selected. Repeatable for a maximum of 8 units. 4 seminars.

ES 450. Fieldwork in Comparative Ethnic Studies. 4 units

Term Typically Offered: W

Prerequisite: ES 390.

Supervised project based on fieldwork in comparative ethnic studies. 4 seminars.

ES 461. Senior Project. 4 units

Term Typically Offered: SP

Prerequisite: ES 390 and departmental approval.

Completion of a project under faculty supervision. Results presented in a formal paper or project.

ES 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: At least one course in Ethnic Studies and consent of instructor.

Directed group study of selected topics for advanced students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 lectures.

Fire Protection Engineering (FPE)

FPE Courses

FPE 500. Individual Study. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of graduate coordinator and supervising faculty member.

Advanced study planned and completed under the direction of a member of the program faculty. Open only to graduate students in the FPE program who have demonstrated ability to do independent work. FPE 500 must be taken as a 4-unit class when substituting for a required course in the FPE program.

FPE 501. Fundamental Thermal Sciences. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Introduction to the thermal sciences, including thermodynamics, fluid dynamics and heat transfer, as they relate to fire protection engineering. Includes 1st and 2nd laws of thermodynamics, conservation relations, hydrostatics, internal and external flows, and heat transfer by conduction, convection and radiation. 4 lectures.

FPE 502. Fire Dynamics. 4 units

Term Typically Offered: W

Prerequisite: FPE 501 or consent of instructor.

First exposure to fire dynamics phenomena. Includes fundamental fire and combustion topics such as thermodynamics of combustion, fire chemistry, premixed and diffusion flames, ignition, burning of liquids and solids, heat release rates, flame spread and fire plumes. 4 lectures.

FPE 503. Flammability Assessment Methods. 4 units

Term Typically Offered: SP

Prerequisite: FPE 502.

Characterization of flammability properties of gaseous, liquid and solid materials. Fire test methods for evaluating flammability properties of materials and burning characteristics of products. Overview of regulatory requirements for restricting the flammability of products and materials used in buildings. 4 lectures.

FPE 504. Fire Modeling. 4 units

Term Typically Offered: SU

Prerequisite: FPE 502, FPE 503.

Fire modeling techniques for fire safety assessment. Application of various engineering correlations and computer-based fire models, including zone models and computational fluid dynamics models, to representative fire problems. 4 lectures.

FPE 521. Egress Analysis and Design. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Regulatory requirements for egress systems in buildings, including occupancy classifications, occupant loads, means of egress components and exit capacities. Introduction to human behavior in fire and to methods for calculating people movement under emergency conditions, including computer-based evacuation models. 4 lectures.

FPE 522. Fire Detection, Alarm and Communication Systems. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor.

Analysis of the operating characteristics of fire detection devices and alarm notification appliances. Introduction to modern fire alarm systems and components. Introduction to mass communication systems. Current installation and approval standards. 4 lectures.

FPE 523. Water-based Fire Suppression. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing.

Analysis and design of water-based fire suppression systems, including water supply analysis and hydraulic calculations. Overview and design considerations for automatic sprinkler, water spray, water mist and foam suppression systems. Typical contemporary installations and current installation and approval standards. 4 lectures.

FPE 524. Structural Fire Protection. 4 units

Term Typically Offered: SU

Prerequisite: Graduate standing or consent of instructor.

Regulation and analysis procedures for structural components of wood, steel, concrete, composites. Structural capabilities, modifications under fire induced exposures. Calculation methods for predicting fire resistance of structural components. Definition of types of building construction. 4 lectures.

FPE 551. Fire Safety Regulation and Management. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Use of model building and fire codes, administrative regulation, retrospective codes, performance-based codes, and risk-based regulation to manage fire safety. Identification and application of different fire risk management tools and techniques. 4 lectures.

FPE 552. Smoke Management and Special Hazards. 4 units

Term Typically Offered: W

Prerequisite: FPE 502 and FPE 504.

Analysis and design of smoke management systems. Assessment of smoke hazards. Identification of special hazards. Analysis and design of fire suppression systems used for fire control of special hazards, including gaseous and chemical agents and systems. 4 lectures.

FPE 554. Forensic Fire Analysis. 4 units

Term Typically Offered: SP

Prerequisite: Consent of graduate coordinator and instructor.

Recommended: FPE 504.

Introduction to the processes of fire investigation and reconstruction. Engineering analysis of structural and wildland fires. Identification of failure mechanisms in fire safety systems. Case studies of actual fire incidents to address and reinforce concepts related to different types of system and performance failures. 4 lectures.

FPE 555. Fire Protection Management in the Wildland-Urban Interface (WUI). 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor. Recommended: LA/NR 318 and NR 340.

Social, economic, political, and technological issues affecting fire management in urbanized landscapes where fire continues its ecological role. Fire risk analysis; needs assessment, legislative codes, standards and policies; liability issues; evacuation; incident response planning. 3 lectures, 1 laboratory.

FPE 556. Advanced Heat Transfer III. 4 units

Term Typically Offered: TBD

Prerequisite: ME 347 or FPE 502; and ME 350.

Advanced principles of heat transfer. Classical solution techniques to problems in radiation with applications related to the role of radiation heat transfer in the development of fire in buildings. 4 lectures. Crosslisted as FPE/ME 556.

FPE 596. Culminating Experience in Fire Protection Engineering. 1-5 units

Term Typically Offered: W, SP

Prerequisite: FPE 504, advanced graduate standing, completion of, or concurrent enrollment in, engineering courses in program, and consent of instructor.

Performance of comprehensive fire and life safety evaluations of buildings and other structures. Communication of the results and findings of such evaluations in written report and by oral presentation. Conducted under supervision of faculty.

FPE 599. Design Thesis. 1-9 units

Term Typically Offered: TBD

Prerequisite: Consent of graduate coordinator and graduate standing.

Each individual will be assigned a thesis project for solution under faculty supervision as a requirement for the master's degree, culminating in a written thesis.

Food Science and Nutrition (FSN)

FSN Courses

FSN 101. Orientation to the Food Science and Nutrition Majors. 1 unit CR/NC

Term Typically Offered: F

Understanding the depth and breadth of the Food Science and Nutrition programs. Emphasis on academic and career planning. Students are required to complete this course within their first year in the major. Separate sections will be offered for each major. Credit/No Credit grading only. 1 lecture.

FSN 121. Fundamentals of Food. 4 units

Term Typically Offered: F, W, SP

Theoretical aspects and practical applications of the principles of culinary science and food preparation. 3 lectures, 1 laboratory.

FSN 125. Introduction to Food Science. 4 units

Term Typically Offered: F

Basic principles of food science. Chemical, physical, and microbiological properties of foods. Ingredient properties, preservation, and processing. Overview of the commercial food processing industry at state and national levels. Field trip may be required. 3 lectures, 1 laboratory.

FSN 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 4 units per quarter.

FSN 201. Enterprise Project. 1-4 units

CR/NC

Term Typically Offered: TBD

Prerequisite: FSN 125 or FSN 230 or FSN 121 and consent of instructor.

Post-harvest processing of a high quality food product. Project participation is voluntary and subject to approval by the department head and the Cal Poly Corporation. Total degree credit for FSN 201 and FSN 401 combined limited to 12 units. Credit/No Credit grading only.

FSN 204. Food Processing Operations. 4 units

Term Typically Offered: W

Prerequisite: FSN 125 or FSN 230.

Applied food manufacturing and processing technology emphasizing unit operations. Water removal in foods (dehydration, spray drying, vacuum concentration), heat removal (refrigeration, freezing), and osmotic preservation. Students produce processed foods in a pilot plant. Field trip may be required. 3 lectures, 1 laboratory.

FSN 210. Nutrition. 4 units

GE Area B5

Term Typically Offered: F,W,SP,SU

Introduction to the science of human nutrition. Nutrient structure, metabolism, function and requirements. Application of nutrition science principles to promote optimal health. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE B5.

FSN 230. Elements of Food Processing. 4 units

Term Typically Offered: F, W, SP

Principles of food processing operations covering thermal processing, freezing, dehydration, fermentation and raw material handling. Overview of food technology, food quality, spoilage, packaging and label requirements. For non-Food Science majors only. Field trip may be required. 3 lectures, 1 laboratory.

FSN 244. Cereal and Bakery Science. 4 units

Term Typically Offered: TBD

Prerequisite: FSN 125 or FSN 230.

Applied science of cereal-based products. Theory and practice underlying preparation of doughs, batters, fillings, and glazes. Chemistry of baking doughs and batters and storage of finished products. Marketing and product development of breads, cakes, cookies, and pastries. Comparative nutritional evaluation of flours, grains, and finished products. 3 lectures, 1 laboratory.

FSN 250. Food and Nutrition: Customs and Culture. 4 units

GE Area D4; USCP

Term Typically Offered: F,W,SP,SU

Anthropological perspective of traditional and contemporary food customs and culture. Major emphasis on U.S. cultures including Native American, Hispanic American, African American, and Asian American. Opportunities to explore personal cultural food experiences. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE D4 and USCP.

FSN 275. Elements of Food Safety. 4 units

Term Typically Offered: SP

Introduction to food safety from farm-to-fork. Topics include good agricultural practices, good manufacturing practices, food safety regulations, and an overview of Hazard Analysis Critical Control Point (HACCP). Emphasis on control of biological, chemical, and physical hazards to assure food safety. Not open to Food Science majors. 4 lectures.

FSN 290. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

FSN 304. Advanced Culinary Principles and Practice. 4 units

Term Typically Offered: TBD

Prerequisite: CHEM 127 and FSN 121.

Chemistry of starch, fat and proteins and its impact on texture, taste, flavor and appearance of food. Effects of microorganisms on changes of food during preparation and storage. 3 lectures, 1 laboratory.

FSN 310. Maternal and Child Nutrition. 4 units

Term Typically Offered: F, W, SP

Prerequisite: FSN 210 and junior standing.

Nutritional needs and related nutritional challenges of women and children, including fertility, pregnancy and lactation; physical, nutritional, social growth and development from infancy through adolescence. Current nutrition issues in maternal and child nutrition. 4 lectures.

FSN 311. Sensory Evaluation of Food. 4 units

Term Typically Offered: W

Prerequisite: STAT 218; FSN 125 or FSN 230.

Sensory attributes of food, physiological basis of sensory evaluation, sensory panels, environment for sensory evaluation, sample preparation and presentation, types of score cards, statistical methods for data analysis and interpretation. 3 lectures, 1 laboratory.

FSN 315. Nutrition in Aging. 4 units

Term Typically Offered: F, W, SP

Prerequisite: FSN 210; sophomore standing.

Nutrition issues in the middle and later years. Changes in organ systems, nutrient needs, functional status, and food preferences as adults age. Nutrition and chronic disease. Nutritional assessment and screening. Nutrition-related health care and social services. 4 lectures.

FSN 319. Food Technology for the Consumer. 4 units

GE Area F

Term Typically Offered: F, SP

Prerequisite: Junior standing and completion of GE Area B.

Overview of the science and technology used to produce the foods consumed on a daily basis. Food science, biotechnology, food law, processing, preservation, ingredient functionality, package label information, and food safety information. Not open to Food Science Majors. 4 lectures. Fulfills GE Area F.

FSN 321. Contemporary Issues in Food Choice and Preparation. 4 units

Term Typically Offered: W, SP

Prerequisite: FSN 121, FSN 210, sophomore standing.

Principles involved in the choice, purchase, and preparation of foods in a variety of settings and for various populations. Contemporary and ongoing issues associated with food and cooking in the context of nutrition and health. Planning and preparation of meals with emphasis on nutritional, aesthetic, economic and cultural aspects of food. 3 lectures, 1 laboratory.

FSN 328. Nutrient Metabolism I. 4 units

Term Typically Offered: F, W

Prerequisite: BIO 161; CHEM 313 or CHEM 371; FSN 210; and junior standing.

Metabolism of carbohydrates, fats and proteins as it applies to human nutrition. Integration and regulation of metabolic pathways. 4 lectures.

FSN 329. Nutrient Metabolism II. 4 units

Term Typically Offered: F, W, SP

Prerequisite: FSN 328.

Continuation of FSN 328. Biochemical, molecular, and physiological functions of vitamins and minerals and their interaction with other nutrients. 3 lectures, 1 laboratory.

FSN 330. Introduction to Principles of Food Engineering. 4 units

Term Typically Offered: F

Prerequisite: FSN 125; MATH 118 or equivalent; and PHYS 121.

Introduction to principles of food engineering and basic calculations needed for food plant operations. Unit conversions, material balance, heat balance, steam heating, psychrometry, vacuum and pressure. Field trip may be required. 3 lectures, 1 laboratory.

FSN 334. Food Packaging. 3 units

Term Typically Offered: SP

Prerequisite: FSN 125 and FSN 204.

Function of food packaging in food processing and preservation. Packaging materials and forms. Regulations and testing of food packaging material. Oral presentation required. 3 lectures.

FSN 335. Food Quality Assurance. 4 units

Term Typically Offered: F

Prerequisite: FSN 125 or FSN 230; junior standing.

Microbiological and physical methods of analyses of foods used in food quality assurance and product development laboratories. Organization and management of quality assurance programs utilizing basic statistical control. Development of food production standards and interpretation of specifications. Packaging and container evaluation. 3 lectures, 1 laboratory.

FSN 341. Fermented Foods. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing and completion of GE Area B.

Processing, manufacturing, historical and bio-technical applications of fermentation technology for the production of food and beverages. Wines of the world, distilled beverages, beers, fermented dairy, vegetable and meat products important to the post-harvest economy of California. 4 lectures.

FSN 342. Brewing Science. 4 units

Term Typically Offered: TBD

Prerequisite: CHEM 313 and MCRO 221.

Scientific principles of malting and brewing. Chemistry, microbiology, and technology of the entire brewing process, from the raw ingredients (barley, malt, hops, water, yeast) to the production of beer and its quality assurance. 4 lectures.

FSN 343. Institutional Foodservice I. 3 units

Term Typically Offered: F, W

Prerequisite: FSN 121 and junior standing.

Principles of equipment selection and food service facility, planning with emphasis on sanitation and safety. 2 lectures, 1 laboratory.

FSN 344. Institutional Foodservice II. 4 units

Term Typically Offered: W, SP

Prerequisite: FSN 321, FSN 343.

Continuation of FSN 343. Economic principles and problems involved in planning and preparing food using institutional equipment to meet specific product standards for large groups. Field trip may be required. 3 lectures, 1 laboratory.

FSN 346. Brewing Methods. 3 units

Term Typically Offered: TBD

Prerequisite: FSN 342.

Introduction to brewing practices and hands-on instruction on industry standard laboratory methods for the analysis of barley, malt, hops, water, yeast, and beer. Perform pilot brews and apply methodologies for the analysis of raw ingredients, process control, and final product. Field trip required. 1 lecture, 2 laboratories. Students must be 18 years of age or older.

FSN 354. Packaging Function in Food Processing. 3 units

Term Typically Offered: SP

Prerequisite: Junior standing.

Basic food spoilage and preservation mechanisms. The role of food packaging in food processing. Package and food compatibility. For non-Food Science majors. 3 lectures.

FSN 364. Food Chemistry. 4 units

Term Typically Offered: F

Prerequisite: FSN 125 or FSN 230, CHEM 313.

Study of molecular properties of major food components such as water, carbohydrates, lipids, proteins, vitamins, minerals, pigments, enzymes and other important molecules as well as chemical reactions of these compounds occurring as a result of processing and or storage. Laboratory focus on assessment of the role of food components in food systems and food products. 3 lectures, 1 laboratory.

FSN 368. Food Analysis. 4 units

Term Typically Offered: W

Prerequisite: FSN 364.

Principles of chemical and biochemical methods and techniques for measuring food protein, carbohydrates, lipids, water, vitamins, minerals and other components of foods using approved methods. 3 lectures, 1 laboratory.

FSN 370. Food Plant Sanitation and Prerequisite Programs. 4 units

Term Typically Offered: W

Prerequisite: FSN 204 and MCRO 221.

Principles and practice of food plant sanitation and prerequisite programs to ensure production of a safe and wholesome food supply. Topics include good manufacturing practices, sanitary design, cleaning and sanitizing compound selection, pest management, waste treatment, and allergen control programs. Field trips required. 4 lectures.

FSN 374. Food Laws and Regulations. 4 units

Term Typically Offered: W

Prerequisite: FSN 125 or FSN 230 or WVIT 102.

Federal, state, and local laws and regulations affecting the production, processing, packaging, marketing, and distribution of food. Emphasis on FDA, USDA and California codes. 4 lectures.

FSN 375. Food Safety. 4 units

Term Typically Offered: SP

Prerequisite: FSN 370.

Principles, practices, and regulations governing and ensuring the chemical, physical, and biological safety of the food supply. Topics include Hazard Analysis Critical Control Point (HACCP), risk assessment, import safety, food bioterrorism and defense, product recalls, and traceability. 3 lectures, 1 activity.

FSN 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 4 units per quarter.

FSN 401. Advanced Enterprise Project. 1-4 units

Term Typically Offered: TBD

Prerequisite: FSN 201 and junior standing and consent of instructor.

Leadership responsibility on enterprise projects. Lead students, under the supervision of instructor, will be accountable for all phases of the project: scheduling times, securing raw product, record keeping, and marketing of the product. Total degree credit for FSN 201 and FSN 401 combined limited to 12 units.

FSN 408. Food Product Development. 4 units

Term Typically Offered: F, SP

Prerequisite: FSN 311; FSN 368; and senior standing.

Functionality of water, carbohydrates, proteins, lipids, additives and other food ingredients used in the formulation, development, and processing of foods. Product development processes from idea generation to marketing to consumer guided technical prototype development will be completed. 3 lectures, 1 laboratory.

FSN 410. Nutritional Implications of Food Industry Practices. 4 units

Term Typically Offered: TBD

Prerequisite: FSN 210; FSN 125 or FSN 230; and junior standing.

Methods for assessing nutritional quality of foods/diets. Nutrient databases for raw and processed foods. Effects of food industry practices (e.g., processing, fortification, new product development, biotechnology) on nutritional quality of foods/diets. Evolution of public policy. 4 seminars.

FSN 415. Nutrition Education and Communications. 4 units

Term Typically Offered: F, SP

Prerequisite: Senior standing. Corequisite: FSN 329.

Application of appropriate behavior and learning theories in nutrition education and communications across diverse population groups. Effective use of techniques, materials, and computer-based technology to enhance communications. Includes community-based learning projects. 4 lectures.

FSN 416. Community Nutrition. 4 units

Term Typically Offered: F, SP

Prerequisite: FSN 328; senior standing. Recommended: FSN 310, FSN 315 and FSN 415.

Federal, state and local nutrition assessment activities and program services. Emphasis on public health, health promotion and disease prevention. Development of skills in assessing community nutrition problems and planning community interventions. 4 lectures.

FSN 417. Nutrition Counseling. 4 units

Term Typically Offered: W, SP

Prerequisite: Senior standing, PSY 201/202. Corequisite: FSN 415.

Communication, behavioral, and counseling theories as they relate to nutrition counseling. Emphasis on development of skills to promote healthy eating behaviors. Examination of eating disorders and obesity, including preventative and therapeutic interventions. 4 lectures.

FSN 420. Critical Evaluation of Nutrition Research. 4 units

Term Typically Offered: F, W, SP

Prerequisite: STAT 218. Corequisite: FSN 329.

Nutrition research terminology and methods. Critical evaluation and interpretation of nutrition research with emphasis on human studies of diet-health relationships. Evidence based review. 4 seminars.

FSN 426. Nutrition and Foodservice Systems Management. 4 units

Term Typically Offered: F, SP

Prerequisite: FSN 344.

Principles of successful organization and management with their application to the effective operation of clinical, community and foodservice systems. Administrative responsibilities of nutrition and foodservice directors. Management theories and practice. Labor relations. Discipline and performance appraisal. 4 lectures.

FSN 429. Clinical Nutrition I. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 231 (ZOO 331 equivalent); BIO 232 (ZOO 332 equivalent); and senior standing. Corequisite: FSN 329.

Application of the nutrition care process to physiological disorders which may alter nutritional requirements or require dietary modifications. Anthropometric, biochemical, clinical, and dietary assessment. Diabetes mellitus, electrolytes, acid-base balance, hydration and enteral and parenteral nutrition. Anemias, pharmacology, cardiovascular disease and obesity. 3 lectures, 1 laboratory.

FSN 430. Clinical Nutrition II. 4 units

Term Typically Offered: F, W, SP

Prerequisite: FSN 429.

Continuation of FSN 429. Application of the nutrition care process to physiological and metabolic disorders which may alter nutritional requirements or require dietary modifications. GI disease, respiratory diseases, metabolic stress, burns, cancer, inborn errors of metabolism, cardiovascular disease, liver disease, and renal disease. 3 lectures, 1 laboratory.

FSN 440. Internship. 1-12 units

Term Typically Offered: TBD

Prerequisite: Junior standing and consent of instructor.

Career experience with private or public agencies. Total credit limited to 12 units. Maximum of 6 units may be applied toward degree requirements.

FSN 444. Food Engineering. 4 units

Term Typically Offered: W

Prerequisite: FSN 204 and FSN 330.

Engineering principles governing heat transfer, fluid flow, and introductory mass transfer and application of these principles to selected unit operations; theoretical aspects of the scientific and engineering principles of fluid flow and the transfer and change of materials and energy primarily by physical means during processing of food. 3 lectures, 1 laboratory.

FSN 461. Senior Project I. 3 units

Term Typically Offered: F, W, SP

Prerequisite: For FDSC majors: Senior standing; completion of GE Area A3 with a grade of C- or better; FSN 364; and STAT 218. For NUTR majors: Senior standing; completion of GE Area A3 with a grade of C- or better; and STAT 218. Corequisite for NUTR majors: FSN 329 and FSN 420.

Selection of scientific research topic in major area. Development of literature review, research questions in Senior Project I. Research design, data collection, and analysis in Senior Project II. Project requires a formal report which must follow departmental guidelines. Minimum of 90 hours per quarter.

FSN 462. Senior Project II. 3 units

Term Typically Offered: F, W, SP

Prerequisite: FSN 461.

Selection of scientific research topic in major area. Development of literature review, research questions in Senior Project I. Research design, data collection, and analysis in Senior Project II. Project requires a formal report which must follow departmental guidelines. Minimum of 90 hours per quarter.

FSN 463. Professional Practice in Nutrition and Dietetics. 2 units

CR/NC

Term Typically Offered: F

Prerequisite: Senior standing. Recommended: FSN 329.

Exploration of students' transition to professional practice, career opportunities, and factors to be considered in career decisions. Application of strategic planning, critical thinking, written and oral communication skills in preparation for nutrition and dietetics professions. 2 lectures.

FSN 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 lectures.

FSN 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

FSN 474. Advanced Food Processing. 4 units

Term Typically Offered: SP

Prerequisite: FSN 444 and senior standing.

Advanced topics in processing operations with emphasis on thermal processing. Non-traditional processing technology such as microwave, ionizing radiation, and high pressure. 3 lectures, 1 laboratory.

FSN 485. Cooperative Education Experience in Food Science and Nutrition. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience with an approved Food Science or Nutrition firm engaged in production or related business, industry or governmental agency. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 12 units. Degree credit limited to 6 units. Credit/No Credit grading only.

FSN 495. Cooperative Education Experience in Food Science and Nutrition. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Full time work experience with an approved Food Science or Nutrition firm engaged in production or related business, industry or governmental agency. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 12 units. Degree credit limited to 6 units. Credit/No Credit grading only.

FSN 500. Individual Study. 1-6 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing, consent of supervising faculty member and graduate advisor.

Advanced independent study planned and completed under the direction of a member of the department faculty. Total credit limited to 6 units.

FSN 501. Lipid Metabolism and Nutrition. 3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Digestion, absorption and metabolism of lipids with emphasis on lipoprotein metabolism, regulation of lipid metabolism, effects of gene expression, essential fatty acid requirements and functions. 3 seminars.

FSN 505. Orientation to Food Science and Nutrition Graduate Studies. 1 unit

CR/NC

Term Typically Offered: F

Prerequisite: Graduate standing.

Orientation to and discussion of research interests in food science and nutrition. Discussion of policy and ethical issues in the conduct of research. Intended for entering graduate students in Food Science or Nutrition. Credit/ No Credit grading only. 1 seminar.

FSN 508. Food Product Innovation. 4 units

Term Typically Offered: TBD

Prerequisite: FSN 408.

Focus on product innovation strategies, project management, product life cycle, project development team management, product innovation metrics, process optimization and cost management. Plan and execute an industry-relevant specialized project. 3 lectures, 1 laboratory.

FSN 516. Population Health and Epidemiology. 3 units

Term Typically Offered: SP

Prerequisite: FSN 416 and graduate standing.

Advanced concepts and issues in population health and epidemiology. Covers epidemiologic methods, study design, and conceptual frameworks from public health perspective. Analytical considerations related to population health will be presented. Emphasis on nutrition-related issues at national and global levels. 3 lectures.

FSN 528. Biochemical and Molecular Aspects of Human Macronutrient Metabolism. 4 units

Term Typically Offered: W

Prerequisite: FSN 328 and graduate standing.

Advanced topics in the human metabolism of carbohydrates, lipids and proteins. Classic and recent findings related to mechanisms of nutrient-regulated gene expression. Metabolism related to specific diseases will also be covered. 4 lectures.

FSN 529. Metabolic and Molecular Aspects of Vitamins. 2 units

Term Typically Offered: SP

Prerequisite: FSN 329 and graduate standing.

Advanced topics in the molecular roles and functions of vitamins. Classic and recent findings related to mechanisms of vitamin-regulated gene expression. Specific aspects of vitamin deficiencies and toxicities will also be covered. 2 lectures.

FSN 530. Metabolic and Molecular Aspects of Minerals. 2 units

Term Typically Offered: SP

Prerequisite: FSN 329 and graduate standing.

Advanced topics in the molecular roles and functions of minerals. Classic and recent findings related to mechanisms of mineral-regulated gene expression. Specific aspects of mineral deficiencies and toxicities will also be covered. 2 lectures.

FSN 541. Dietetic Internship Seminar. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Acceptance into the Cal Poly, San Luis Obispo Dietetic Internship, a special session program in Extended Education.

A forum for dietetic interns to make presentations and share their experiences in their supervised practice. Guest presentations on current issues in nutrition therapy, foodservice management and community nutrition. Total credit limited to 6 units, with a maximum of 2 units per quarter. Credit/No Credit grading only. 2 seminars.

FSN 564. Chemistry of Food Systems. 4 units

Term Typically Offered: TBD

Prerequisite: FSN 364 or graduate standing.

Integration of food chemistry concepts to develop an in-depth understanding on the role of structural and functional properties of components in food systems. Research topics for components in specific food systems. 4 lectures.

FSN 570. Selected Topics in Food Science and Nutrition. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 seminars.

FSN 571. Selected Advanced Laboratory in Food Science and Nutrition. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

FSN 574. Food Process Failure Analysis. 4 units

Term Typically Offered: TBD

Prerequisite: FSN 335 or graduate standing; FSN 444; and FSN 474.

Analysis of root causes and impacts of failure scenarios within the food industry. Corrective actions relative to safety, quality, and economics of the affected products will be assessed. 3 lectures, 1 activity.

FSN 575. Advanced Food Safety. 4 units

Term Typically Offered: TBD

Prerequisite: FSN 375 or graduate standing; and MCRO 421.

In-depth analysis of food safety issues including outbreaks, risk assessment, Food Safety Modernization Act (FSMA), product and process assessments. Special emphasis on the critical evaluation, development and execution of food safety research. 3 lectures, 1 laboratory.

FSN 581. Graduate Seminar in Food Science and Nutrition. 1-3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Current findings and research problems in the field and their application to food science and nutrition. Class Schedule will list topic selected. Total credit limited to 6 units with approval of advisor. 1-3 seminars.

FSN 599. Thesis. 1-6 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and consent of instructor.

Individual research in food science and nutrition under faculty supervision leading to a graduate thesis of suitable quality. Total credit limited to 6 units.

French (FR)

FR Courses

FR 101. Elementary French I. 4 units

Term Typically Offered: F

Beginning French. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and conversation. Language taught in its intercultural context. 3 lectures, 1 activity.

FR 102. Elementary French II. 4 units

Term Typically Offered: W

Prerequisite: FR 101 or appropriate score on placement exam or consent of instructor.

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and conversation. Language taught in its intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

FR 103. Elementary French III. 4 units

Term Typically Offered: SP

Prerequisite: FR 102 or appropriate score on placement exam or consent of instructor.

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and conversation. Language taught in its intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

FR 201. Intermediate French I. 4 units

GE Area C5

Term Typically Offered: F

Prerequisite: FR 103 or appropriate score on placement exam or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in French within an intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Fulfills GE C5.

FR 202. Intermediate French II. 4 units

GE Area C5

Term Typically Offered: W

Prerequisite: FR 201 or appropriate score on placement exam or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in French within an intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Fulfills GE C5.

FR 203. Intermediate French III. 4 units

GE Area C5

Term Typically Offered: SP

Prerequisite: FR 202 or appropriate score on placement exam or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in French within an intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Fulfills GE C5.

FR 233. Critical Reading in French Literature. 4 units

GE Area C1

Term Typically Offered: F

Prerequisite: Completion of GE Area A with a grade of C- or better; and FR 203 or consent of instructor.

Selected readings in French from Francophone authors that illustrate the French literary tradition from the Middle Ages to the present in both France and other French-speaking countries. May include film and other media. Conducted in French. 4 lectures. Fulfills GE C1.

FR 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics. Open only to undergraduate students. Conducted in French. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

FR 301. Advanced French Composition and Grammar. 4 units

Term Typically Offered: W, SP

Prerequisite: FR 203 or consent of instructor.

Written and oral development of structural grammar, syntax and complex components of French. Expansion of vocabulary and idiomatic expressions through text study. Written compositions. May include French/English translation. Conducted in French. 4 lectures.

FR 302. Advanced French Conversation and Grammar. 4 units

Term Typically Offered: W, SP

Prerequisite: FR 203 or consent of instructor.

Oral and written development of structural grammar, syntax and complex components of French. Expansion of vocabulary and idiomatic expressions through topics focusing on culture. Individual and/or group presentations. Conducted in French. 4 lectures.

FR 305. Significant Works in French. 4 units

GE Area C4

Term Typically Offered: F

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and FR 233 or consent of instructor.

Critical analysis and oral discussion of poetry, essays, novels, plays, films, and other media by selected French and Francophone authors. Conducted in French. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Fulfills GE C4 except for Modern Languages and Literatures majors.

FR 350. French Literature in English Translation. 4 units

GE Area C4

Term Typically Offered: W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course in Area C1.

Selected works to be read by students in English translation. Critical analysis, interpretation, and comparison of works by French and/or Francophone authors. Course may include film and other media. Discussion in English. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Fulfills GE C4 except for Modern Languages and Literatures majors.

FR 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Conducted in French. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

Geography (GEOG)

GEOG Courses

GEOG 150. Human Geography. 4 units

GE Area D3

Term Typically Offered: F, W, SP

The interplay of cultures, places, and environments, with emphasis on diversity and globalization. Topics include characteristics and patterns of human population, migration, ethnicity, agriculture, geopolitics, language, religion, urbanization, industry, and international development. 4 lectures. Fulfills GE D3.

GEOG 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

GEOG 250. Physical Geography. 4 units

Term Typically Offered: F, W

Addresses the origins and patterns of the earth's diverse assemblage of climates, landforms, biota and soils. A major focus on relationship between human cultures and these earthly environments. 4 lectures. Crosslisted as ERSC/GEOG 250.

GEOG 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

GEOG 300. Geography of United States. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area A with a grade of C- or better; and GE Area D3.

The population (including origin, ethnicity, migration, and distribution), land utilization, and economic development viewed against the background of the physical environment. Topically and regionally organized. Pervading themes include landscape evolution and alteration, regional cultural distinctiveness, and current problems. 4 lectures. Fulfills GE D5 except for Anthropology/Geography and Social Sciences majors.

GEOG 301. Geography of Resource Utilization. 4 units

GE Area D5

Term Typically Offered: F

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area D3.

Multicultural, global perspective on the interdependence of people, ecosystems, and resource utilization. Topics include population, resource economics, food, forestry, fishing, water resources, air pollution, climate change, minerals, and energy. Grounded in principles of economic geography and environmental science, with emphasis on sustainability. 4 lectures. Fulfills GE D5 except for Anthropology/Geography majors.

GEOG 308. Global Geography. 4 units

GE Area D5

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area D1.

Examination of the major world regions such as Europe, the Middle East, Africa, Asia and Latin America. Focus on the origins and content of contemporary cultural landscapes and on their utility for understanding international differences, interactions, and current events. Particular attention to the relationship between humans and the environment. 4 lectures. Fulfills GE D5 except for Anthropology/Geography and Social Sciences majors.

GEOG 318. Applications in GIS. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and computer literacy.

ArcGIS Desktop Geographic Information System (GIS) computer software to explore environmental, natural resource, social and economic issues using spatial data. Principles of cartography and map interpretation. Development of data base and software management competencies. 2 lectures, 2 laboratories.

GEOG 325. Climate and Humanity. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing.

Geographic perspective on the interrelationships between climate and human cultures. Effects of people on climate and the influence of climate and weather upon human activities and behavior. Focus on global human conditions which are responsible for the alteration of climate and in turn are vulnerable to climate change. 4 lectures. Crosslisted as ERSC/GEOG 325.

GEOG 328. Applications in Remote Sensing. 4 units

Term Typically Offered: W, SP

Prerequisite: GEOG 250 and junior standing.

Introduction to the use of satellite imagery to analyze natural and human features on the earth. Applications in geology, water, climate, vegetation, agriculture, and urban land use. Fundamentals of processing digital satellite images. Emphasis on bridging the earth and social sciences. 3 lectures, 1 laboratory.

GEOG 333. Human Impact on the Earth. 4 units

Term Typically Offered: W

Prerequisite: Junior standing.

Global assessment of the impact of humans on the earth's vegetation, animals, soil, water and atmosphere. Emphasis on problems stemming from the interactions of human attitudes, technologies, and population with natural resources. 4 lectures. Crosslisted as ERSC/GEOG 333.

GEOG 340. Geography of California. 4 units

Term Typically Offered: W

Prerequisite: Junior standing.

Analysis of the land and people of California from a geographical perspective. Patterns of environment, history, settlement, water, agriculture, ethnicity, economy, politics, and urban growth. Current issues are examined in a national and global context. 4 lectures.

GEOG 350. The Global Environment. 4 units

GE Area F

Term Typically Offered: F

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area B.

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/ historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 4 lectures. Crosslisted as AG/EDES/ENGR/GEOG/ISLA/SCM/UNIV 350. Fulfills GE Area F.

GEOG 370. Geography of Latin America. 4 units

GE Area D5

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area D3.

Geographic analysis of the lands and peoples of Mexico, Central America, the Caribbean, and South America. Patterns of environment, culture, politics, economy, and development. Issues (local, regional, and global) shaping Latin America today, with emphasis on U.S.-Latin America relations. 4 lectures. Fulfills GE D5 except for Anthropology/Geography majors.

GEOG 380. Geography of the Caribbean. 4 units

GE Area D5

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; GE Area D3; and an additional Area D course.

Geographic analysis of the Caribbean including the Greater Antilles, Lesser Antilles, and the Caribbean coasts of Central and South America. Investigates patterns and relationships between the physical and cultural geographies from local, regional, and global perspectives. 4 lectures. Fulfills GE D5 except for Anthropology and Geography majors.

GEOG 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

GEOG 408. Geography of International Development. 4 units

Term Typically Offered: F

Prerequisite: GEOG 308.

Detailed analysis of international development from a geographical perspective. Survey of various theories of development and their cultural and ecological components at multiple geographic scales, including institutions and actors involved. Applicable skills for development research and practice, emphasizing sustainability. 4 lectures.

GEOG 414. Global and Regional Climatology. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing.

The earth's pattern of climates and the physical processes that account for them. Focus on interrelationships between climate and the physical/biological and cultural environments. Special emphasis on modern climate changes and their consequences. 3 lectures, 1 laboratory. Crosslisted as ERSC/GEOG 414.

GEOG 415. Applied Meteorology and Climatology. 4 units

Term Typically Offered: SP

Prerequisite: ERSC/GEOG 250.

Physical processes in the atmosphere that determine regional weather, climate and climate variability. Surface and satellite systems for weather observation, and weather/climate modeling. Dynamics of weather systems, including thunderstorms and hurricanes. Emphases on weather/climate affecting agriculture and other human activities. 3 lectures, 1 activity. Crosslisted as ERSC/GEOG 415.

GEOG 440. Advanced Applications in GIS. 4 units

Term Typically Offered: TBD

Prerequisite: GEOG 318.

Applications in Geographic Information Systems (GIS) emphasizing research, methodologies, and career fields to geography, earth sciences, and the social sciences. 2 lectures, 2 laboratories.

GEOG 455. Anthropology-Geography Research Design and Methods. 4 units

Term Typically Offered: W

Prerequisite: Completion of one GE B2 and two upper division ANT or GEOG classes.

Development of knowledge and skills needed to conduct original scientific anthropology-geography research and prepares students for senior projects. Various empirical methodologies highlighted, with a focus on quantitative design and measurement of human culture, biology, behavior, environment and ecology. 3 lectures, 1 laboratory. Crosslisted as ANT/GEOG 455.

GEOG 461. Senior Project I. 2 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

GEOG 462. Senior Project II. 2 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

GEOG 464. Professional Preparation for Anthropologists/Geographers. 1 unit

CR/NC

Term Typically Offered: TBD

Prerequisite: Junior standing, ANT 201, GEOG 150.

Preparation for professional advancement in the fields of anthropology and geography. Supervised career planning emphasizing resume development, selection of an internship or international experience, exploration of career options and graduate programs. Lectures from outside, practicing professionals. Credit/No Credit grading only. 1 seminar.

GEOG 465. Internship. 3-8 units

CR/NC

Term Typically Offered: TBD

Prerequisite: GEOG 464, senior standing and/or consent of instructor.

Supervised training, research, and work in public and private organizations. Credit/No Credit grading only. Total credit limited to 18 units.

GEOG 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 12 units. 1-4 lectures.

Geology (GEOL)

GEOL Courses

GEOL 102. Introduction to Geology. 4 units

GE Area B3

Term Typically Offered: F, W, SP

Processes responsible for the Earth's minerals, rocks, and structure surface features. Volcanism; mountain building; plate tectonics; weathering. Erosion and deposition by streams, glaciers, wind and waves. Geological resources, earth hazards, and interaction of man with global processes. 3 lectures, 1 discussion. Fulfills GE B3.

GEOL 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

GEOL 201. Physical Geology. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 119.

Processes responsible for the Earth's rocks, structural surface features, geologic hazards, and natural resources, with emphasis on interactions with human activities. 3 lectures.

GEOL 203. Fossils and the History of Life. 4 units

GE Area B5

Term Typically Offered: W

Fossil record. Geologic time scale. Evolution and the fossil record. Evolution - creation controversy. Early earth and early life. Features, lifestyles, origins, and histories of major invertebrate, vertebrate, and plant groups. Mass extinctions. 3 lectures, 1 discussion. Fulfills GE B5.

GEOL 205. Earthquakes. 4 units

GE Area B3

Term Typically Offered: F, SP

World-wide seismicity and plate tectonics. Seismic waves and their recording. Earth structure and composition. Intensity, magnitude, and energy. Major California faults and earthquakes. Paleoseismology, forecasting and prediction. Acceleration, resonance, and effects of ground shaking on structures. Earthquake safety. Tsunamis. 3 lectures, 1 discussion. Fulfills GE B3.

GEOL 206. Geologic Excursions. 1 unit

CR/NC

Term Typically Offered: F, SP

Field trips to places of geologic interest. The Schedule of Classes will indicate destinations. Students must provide their own transportation, food, and camping equipment. May be repeated for a maximum of 3 units provided field trips are taken to different locations. Credit/No Credit grading only. 1 laboratory.

GEOL 241. Physical Geology Laboratory. 1 unit

Term Typically Offered: F, SP

Corequisite: GEOL 102 or GEOL 201.

Properties and identification of minerals and rocks. Topographic maps and landform analysis. Geologic maps and interpretation of rock structure. 1 laboratory.

GEOL 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

GEOL 305. Fundamentals of Seismology. 4 units

GE Area B6

Term Typically Offered: W

Prerequisite: PHYS 141; and GEOL 201 or PHYS 132.

Theory of plate tectonics. Elastic waves in layered media. Principle of the seismometer. Seismic properties, structure and composition throughout the Earth. Intensity, magnitude, and seismic moment and energy calculations. Major California faults and earthquakes. Paleoseismology, forecasting and prediction. Analysis of ground motion. Resonance. Effects of ground shaking on structures and bodies of water. Earthquake safety. Field trip required. 3 lectures, 1 laboratory. Fulfills GE B6.

GEOL 310. Igneous and Metamorphic Petrology. 4 units

Term Typically Offered: W

Prerequisite: GEOL 102 or GEOL 201, and ERSC 223.

Processes associated with melting, igneous crystallization, and metamorphism of igneous and sedimentary rocks. Special attention to relationships with tectonic setting. Required field trip. 3 lectures, 1 laboratory.

GEOL 330. Principles of Stratigraphy. 4 units

Term Typically Offered: SP

Prerequisite: GEOL 102 or GEOL 201, and GEOL 241.

Description and analysis of stratified rock and sediment. Sedimentology, diagenesis, transgressive/regressive sequences, bedform interpretation, marine and terrestrial sediment and sedimentary-rock sequence interpretation, and sequence stratigraphy. Required field trips. 3 lectures, 1 laboratory.

GEOL 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigations, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

GEOL 401. Field-Geology Methods. 4 units

Term Typically Offered: W

Prerequisite: GEOL 102 or GEOL 201, GEOL 241, GEOL 415, ERSC 223, ERSC 323.

Collecting and interpreting field-geologic data. Description of sedimentary rocks and construction of stratigraphic columns. Mapping geologic structures in the field. Surficial geologic stratigraphy and surficial geologic mapping. Understanding geologic processes through field study. Communicating results of field study. 1 lecture, 3 activities. Crosslisted as ERSC/GEOL 401.

GEOL 402. Geologic Mapping. 4 units

Term Typically Offered: SP

Prerequisite: ERSC/GEOL 401.

Bedrock geologic mapping on topographic maps and aerial photos. Surficial geologic mapping on topographic maps and aerial photos. Correlating and defining surficial geologic map units on the basis of soil development. Understanding landscape evolution using soil development 4 activities. Crosslisted as ERSC/GEOL 402.

GEOL 404. Research Experience for Advanced Undergraduates. 1-2 units
CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigations, research, studies, or surveys of selected problems. Credit/No Credit grading only. Total credit limited to 4 units, with a maximum of 2 units per quarter.

GEOL 415. Structural Geology. 4 units

Term Typically Offered: F

Prerequisite: GEOL 241 and ERSC 223.

Recognition, interpretation, and depiction of geological structures. Understanding rock deformation through the study of faults and folds. 3 lectures, 1 laboratory. Required weekend field trips.

GEOL 420. Applied Geophysics. 3 units

Term Typically Offered: F

Prerequisite: GEOL 201 and PHYS 141.

Introduction to geophysical exploration of the shallow subsurface: seismic refraction, seismic reflection, electrical resistivity, magnetic and gravity methods. Application to determination of subsurface structure, groundwater and mineral resources. Field trip required. 2 lectures, 1 laboratory.

GEOL 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

GEOL 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

German (GER)

GER Courses

GER 101. Elementary German I. 4 units

Term Typically Offered: F

Beginning German. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing and conversation. Language taught in its intercultural context. 3 lectures, 1 activity.

GER 102. Elementary German II. 4 units

Term Typically Offered: W

Prerequisite: GER 101 or appropriate score on placement exam or consent of instructor.

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing and conversation. Language taught in its intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

GER 103. Elementary German III. 4 units

Term Typically Offered: SP

Prerequisite: GER 102 or appropriate score on placement exam or consent of instructor.

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing and conversation. Language taught in its intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

GER 201. Intermediate German I. 4 units

GE Area C5

Term Typically Offered: F

Prerequisite: GER 103 or appropriate score on placement exam or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in German within an intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Fulfills GE C5.

GER 202. Intermediate German II. 4 units

GE Area C5

Term Typically Offered: W

Prerequisite: GER 201 or appropriate score on placement exam or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in German within an intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Fulfills GE C5.

GER 203. Intermediate German III. 4 units

GE Area C5

Term Typically Offered: SP

Prerequisite: GER 202 or appropriate score on placement exam or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in German within an intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Fulfills GE C5.

GER 233. Critical Reading in German Literature. 4 units

GE Area C1

Term Typically Offered: F

Prerequisite: Completion of GE Area A with a grade of C- or better; and GER 203 or consent of instructor.

Selected readings from German-language authors that show the literary tradition from the Middle Ages to the present. May include film and other media. Conducted in German. 4 lectures. Fulfills GE C1.

GER 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics. Open only to undergraduate students. Conducted in German. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

GER 301. Advanced German Composition and Grammar. 4 units

Term Typically Offered: W

Prerequisite: GER 203 or consent of instructor.

Written and oral development of structural grammar, syntax and complex components of German. Vocabulary expansion and idiomatic construction. Written compositions. May include German/English translation. Conducted in German. 4 lectures.

GER 302. Advanced German Conversation and Grammar. 4 units

Term Typically Offered: W

Prerequisite: GER 203 or consent of instructor.

Oral and written development of structural grammar, syntax and complex components of German. Expansion of vocabulary and idiomatic expressions through topics focusing on culture. Individual and/or group presentations. Conducted in German. 4 lectures.

GER 305. Significant Works in German. 4 units

GE Area C4

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GER 233 or consent of instructor.

Critical analysis and oral discussion of poetry, essays, novels, plays, films, and other media by selected German-language authors. Conducted in German. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Fulfills GE C4 except for Modern Languages and Literatures majors.

GER 350. German Literature in English Translation. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course in Area C1.

Selected works to be read by students in English translation. Critical analysis, interpretation, and comparison of works by German-language authors. Course may include film and other media. Discussion in English. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Fulfills GE C4 except for Modern Languages and Literatures majors.

GER 470. Selected Advanced Topics. 4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Conducted in German. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

Graduate Studies (GS)

GS Courses

GS 597. Continued Graduate Study. 1-15 units

CR/NC

Term Typically Offered:

Prerequisite: Must be in good standing in a graduate program at Cal Poly.

Activities other than regular coursework that are needed to complete the requirements for the degree. Analysis of data, thesis and project report writing, oral defense of the thesis/project, preparation for the comprehensive exam, and other activities related to the culminating experience for the student's program. Can be used to fulfill the continuous enrollment requirement for graduate students. Units earned in this course may not be used toward degree completion. Credit/No Credit grading only. Total credit limited to 15 units; repeatable in same term.

Graduate Studies-Accounting (GSA)

GSA Courses

GSA 501. Graduate Accounting Individual Research. 1-4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing in Accounting and formal petition with approval from the Associate Dean.

Advanced individual research in accounting topics planned and completed under the direction of a member of the college faculty. Designed to meet the needs of qualified students who wish to pursue investigations in accounting which cannot be followed effectively in regularly offered elective courses. A formal written proposal must be accepted by the Associate Dean of OCOB before work begins.

GSA 536. Taxation of Trusts, Estates, and Transfer Taxes. 4 units

Term Typically Offered: SP

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Income taxation of trusts and estates as flow-through entities; transfer taxation of gifts and estates, including generation-skipping transfers. 4 lectures.

GSA 537. State and Local Taxation. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Multi-state income and franchise taxation; property taxes; sales and use taxes; and the constitutional authority for the imposition of state taxes. 4 lectures.

GSA 538. Current Developments in Taxation. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Current developments in income taxation of individuals, trusts and estates and business entities; transfer taxation of gifts and estates; and ethics and professional responsibility in taxation. 4 lectures.

GSA 539. Clinical Tax Education Internship. 9 units

CR/NC

Term Typically Offered: W

Prerequisite: OCOB graduate standing in Specialization in Tax, MS Accounting program.

Accounting internship that allows graduate level accounting students the opportunity to apply skills and competencies to an employment opportunity. Placement in a full-time supervised work experience at a public accounting firm or in an accounting or internal audit department of a private enterprise or government agency. Credit/No Credit grading only.

GSA 540. Taxation of Corporations and Partnerships. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Comparative study of the taxation of C corporations and flow-through tax entities, including S corporations, partnerships and limited liability companies. Not open to students with credit in BUS 417. 4 lectures.

GSA 541. Advanced Financial Reporting Issues I. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Comprehensive coverage of selected advanced financial accounting and reporting topics. Topics include accounting changes and errors, leases, pensions and other post-employment benefits, income taxes, and consolidated financial statements. 4 seminars.

GSA 543. Advanced Financial Reporting Issues II. 5 units

Term Typically Offered: SP

Prerequisite: GSA 541 and OCOB graduate standing or approval from the Associate Dean.

Comprehensive coverage of selected advanced financial accounting and reporting topics. Topics include financial statement footnote and MD&A disclosures and coverage of SEC statutes, regulations and filing forms. 5 seminars.

GSA 544. Advanced Enterprise Wide Business Processes for Accounting. 4 units

Term Typically Offered: W

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Study of various transactions in order to understand the underlying business processes and information flows between various business units, in order for a transaction to occur and be properly reported, and the information determined that is critical for the information system to capture. Emphasis of role of information systems in controlling the authorization of transactions, access to information, access to assets, preparation of accounting records and reports. 3 seminars, 1 activity.

GSA 545. Applied Accounting Research and Communications. 4 units

Term Typically Offered: W

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Advanced use of authoritative accounting and auditing data bases and actual filings by public companies. Frequent writing and speaking exercises. Real world accounting and auditing issues facing public and private enterprises. In-depth coverage of federal and state regulation of securities transactions.

GSA 546. Tax Research and Administrative Procedures. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Research techniques applicable to tax issues including the communication of research results. Administrative procedures necessary for tax compliance with the various tax jurisdictions with primary emphasis on IRS practices. 2 seminars, 2 activities.

GSA 548. Advanced Individual Taxation and Tax Planning. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Advanced concepts concerning the impact of taxes on individuals. Introduction to transfer taxes imposed on individuals. Financial, estate and compensation tax planning issues. 4 seminars.

GSA 549. Advanced Taxation of Flow-Through Entities. 4 units

Term Typically Offered: SP

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Advanced and special topics related to the income tax treatment of partnerships, limited liability companies, trusts and S corporations and their owners and beneficiaries. Creation, operation, liquidation and sale of such organizations. 4 seminars.

GSA 550. Advanced Corporate Taxation. 4 units

Term Typically Offered: SP

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Advanced and special topics related to the income tax treatment of regular corporations and their shareholders. Mergers and acquisitions, tax accounting methods and periods, cross-boundary topics, and current issues. 4 seminars.

GSA 551. International Taxation. 4 units

Term Typically Offered: SP

Corequisite: BUS 417, or BUS 414 and BUS 415, and OCOB graduate standing or approval from the Associate Dean.

Fundamental tax concepts of inbound and outbound investments of U.S. taxpayers, controlled foreign corporations, Subpart F, the foreign tax credit, transfer pricing and contracting country treaties. 4 lectures.

GSA 552. Fraud Auditing and Examination. 4 units

Term Typically Offered: W

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Occupational and financial statement fraud; particular emphasis on the breakdown of corporate governance and ethics systems and developing internal control systems to prevent and detect fraudulent activities. 4 lectures.

GSA 553. International Accounting. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

International accounting, auditing, and corporate governance standards including international financial reporting standards (IFRS). 4 lectures.

GSA 554. Advanced Spreadsheet Modeling for Accounting. 4 units

Term Typically Offered: SP

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Advanced topics in electronic spreadsheets and their use in accounting and financial applications. Developing spreadsheet models for data analysis and decision making. Integrating automation tools and external data sources into spreadsheets. 4 lectures.

GSA 555. Database Modeling and Analysis for Accounting. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Fundamental concepts in database analysis, design, implementation, administration, and audit including issues such as requirements specification, REA modeling, ER modeling, normalization, SQL, transaction control, database security, and query optimization. May also include topics such as data warehouses, XBRL and ebXML. 4 lectures.

GSA 556. Financial Accounting and Valuation. 4 units

Term Typically Offered: SP

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Comprehensive coverage of approaches to the measurement of fair values that are used in accounting situations such as mergers and acquisitions, recognition of stock based compensation, and determination of impairments in the carrying amounts of long-lived assets including intangible assets and goodwill. Role of financial reporting in the valuation of securities, credit analysis, and the determination of the cost of capital. 4 lectures.

GSA 570. Selected Advanced Topics for Accounting. 1-4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

Graduate Studies-Business (GSB)

GSB Courses

GSB 500. Independent Study. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: OCOB graduate standing and formal petition with approval from the Associate Dean.

Advanced study planned and completed under the direction of the Director of Graduate Programs. Open only to graduate students who have demonstrated ability to do independent work. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins.

GSB 501. Individual Research. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: OCOB graduate standing and formal petition with approval from the Associate Dean.

Advanced individual research planned and completed under the direction of a member of the college faculty. Designed to meet the needs of qualified students who wish to pursue investigations which cannot be followed effectively in regularly offered elective courses. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins.

GSB 503. Collaborative Industry Project. 1-8 units

Term Typically Offered: F,W,SP,SU

Prerequisite: OCOB graduate standing and formal petition with approval from the Associate Dean.

Collaborative business project with a client organization that allows graduate level students the opportunity to apply knowledge, skills and competencies to address a business problem. Small teams work in collaboration with a client organization and a faculty advisor. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. The project may last up to one year.

GSB 510. Data Visualization and Communication in Business. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Principles of data visualization and storytelling. Data visualization tools for different types of data in the context of business analytics. Communication of results for business actionable insights. Software use includes Excel, Tableau and R. 3 lectures, 1 laboratory.

GSB 511. Accounting for Managers. 4 units

Term Typically Offered: W

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Emphasis on development of the ability to read and interpret public and internal financial reports. Public reporting responsibilities of companies and management's responsibilities for developing and maintaining effective internal control systems. 3 lectures, 1 activity.

GSB 512. Quantitative Analysis. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Focus on a variety of statistical techniques that help to transform data into useful information that can be used to make informed business predictions and decisions. 3 seminars, 1 laboratory.

GSB 513. Organizational Behavior. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Application of behavioral, social and organizational science concepts to management. Individual, team and organizational levels of analysis, including such topics as expectations, perception, motivation, communications, creativity, leadership, cultural and ethical behavior, group dynamics, team effectiveness, work design, organization change and development. 4 seminars.

GSB 514. The Legal and Regulatory Environment of Business. 4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Legal and regulatory environment in which business operates. Consideration of historical, societal, and global perspectives reflecting political, social and/or economic beliefs and values. Strong emphasis on fundamental concepts of law and analytical tools to understand interaction between law, ethics and management decisions. 4 seminars.

GSB 516. Strategic Marketing Analytics. 4 units

Term Typically Offered: W

Prerequisite: GSB 512 or GSE 518 or IME 503.

Analysis of customer information, using a broad range of tools and techniques including predictive, statistical, and optimization models. Integration of data into reporting platforms. Application of findings to marketing decision-making. 4 lectures.

GSB 520. Data Management for Business Analytics. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Exploration of data management including relational databases, data warehouses, and NOSQL databases. Foundation for analyzing, designing, implementing and using information repositories in a business environment. Topics include the database development life cycle, data modeling, SQL programming, data quality and integration. Course may be offered in classroom-based or online format. 4 lectures.

GSB 522. Advanced Management Information Systems. 4 units

Term Typically Offered: SP

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Analysis of the challenges, successes, and failures managers face when planning for and implementing information system initiatives, particularly enterprise systems such as supply chain management, customer relationship management and enterprise resource planning systems. Focus on the strategic and operational impact of emerging information technologies in modern day business management. Design and development of knowledge worker applications including database and decision support systems. 3 lectures, 1 activity.

GSB 523. Managerial Economics. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Managerial economics, or microeconomics, focuses on private markets. Choices made by firms and consumers within topics that include demand, supply, efficiency, marketing structure, and government intervention. Development of an analytical framework for analyzing how these topics are important for managers. 4 lectures.

GSB 524. Marketing Management. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Introduction to marketing management. Concepts and principles necessary to plan, direct and control the product, promotion, distribution and pricing strategies of the firm. 4 lectures.

GSB 529. Effective Communication Skills for Managers. 4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Enhancement of business writing and oral presentation skills, organized around two areas: 1) preparing written business documents and reports, and 2) professional oral presentation skills. Preparation of a variety of business reports and documents. Multiple business presentations. 4 lectures.

GSB 530. Data Analytics and Mining for Business. 4 units

Term Typically Offered: W

Prerequisite: GSA 555 or GSB 520.

Exploration of the concepts, tools and techniques of data mining in the business context, using case study and problem-solving approaches. Topics include multidimensional data modeling, predictive analytics, pattern discovery, forecasting, text mining, and data visualization. 4 lectures.

GSB 531. Managerial Finance. 4 units

Term Typically Offered: W

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Theories, practices and tools of corporate financial decision making. Topics include valuation of fixed income securities and stocks, capital budgeting, capital structure, dividends, and an overview of financial markets and institutions. Introduction to valuation of derivative securities, market efficiency, and agency costs. 4 seminars.

GSB 533. Aggregate Economics Analysis and Policy. 4 units

Term Typically Offered: SP

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Development of the theoretical and empirical framework of the macroeconomy in which businesses must operate. Topics include GDP, inflation, unemployment, interest rates and monetary and fiscal policies. The dynamics of the macroeconomic environment over time. 4 lectures.

GSB 534. Lean Operations Management. 4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Introduction to the operations function and its interaction with other areas in an organization. Emphasis on applying lean six sigma thinking to achieve competitive advantage in cost, quality, time, and flexibility in manufacturing and service operations. 4 lectures. Course may be offered in classroom-based or online format.

GSB 539. Graduate Internship in Business. 2-8 units

CR/NC

Term Typically Offered: W

Prerequisite: OCOB graduate standing and formal petition with approval from the Associate Dean.

Correlation of experience and academic knowledge. Placement in a supervised business or public organization. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. Credit/No Credit grading only.

GSB 550. Bayesian Econometrics. 4 units

Term Typically Offered: TBD

Prerequisite: GSE 520.

Introduction to Bayesian econometrics with a focus on business decision making. Making appropriate use of prior information; computation of posterior densities; Bayesian forecasting and policy evaluation; model selection and diagnostic tools; alternative loss functions tailored to specific business applications. 4 lectures.

GSB 555. Negotiation. 4 units

Term Typically Offered: SP

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Theory and practice of negotiation in a variety of professional and managerial contexts (e.g., business acquisitions, compensation, business disputes, transfer pricing, inter- and intra-organizational) and in one-on-one, group, and team-based arrangements. Includes impact of culture, ethics, dispute resolution, coalitions and use of creativity to develop integrative solutions. 4 seminars.

GSB 556. Entrepreneurship and New Venture Management. 4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Exploration of entrepreneurship with emphasis on the formation and management of new business ventures. Analysis of typical operating problems of these firms and application of appropriate techniques for their solution. 4 seminars.

GSB 562. Seminar in General Management and Strategy. 4 units

Term Typically Offered: SP

Corequisite: OCOB graduate standing and GSB 511, GSB 513, GSB 523, GSB 531, GSB 533 and either GSB 512 or IME 503; and either GSB 524 or GSB 573; and either GSB 534 or IME 580, or approval from the Associate Dean.

Application of interdisciplinary skills to business and corporate strategy formulation and implementation. Analysis of interdependence between external environments and internal systems. Focus on responsibilities, tasks, and skills of general managers. Case studies, group problem solving. Integrating course of MBA core curriculum. Course satisfies comprehensive examination requirement. 4 seminars.

GSB 563. International Business Tour. 4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Business tour exposure to different management systems and their operating environments. Pre-trip and on-the-road meetings, readings, case studies and discussions. Tours of firms, government offices, ministries, etc; interviews of managers and government officials. Conducted in English. Passport required. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 2 seminars, 2 activities.

GSB 564. Entrepreneurial Finance. 4 units

Term Typically Offered: TBD

Prerequisite: GSB 531 and OCOB graduate standing or approval from the Associate Dean.

The process of financing new and fast-growing firms. Preparation of pro forma financial statements for a new venture. Readings on the venture capital process, from seed capital through the initial public offering (IPO). Valuation of firms seeking venture capital, and those planning their IPO. Valuing convertible securities. Real options valuation. 4 lectures.

GSB 569. Managing Technology in the International Legal Environment. 4 units

Term Typically Offered: SP

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Practical legal decisions required to conduct business for or with high technology companies. Methods to protect high technology developments in international markets, including copyrights, patents, trade secrets, trademarks and contracts. 4 seminars.

GSB 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Directed group study of selected topics for advanced students. Total credit limited to 8 units. The Schedule of Classes will list title selected. 1-4 seminars.

GSB 573. Marketing Research. 4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing; and GSB 512 or GSE 518 or IME 503 or approval from the Associate Dean.

Preparation to become competent users and creators of marketing research information. Focus on collecting customer information as well as analyzing, interpreting and presenting information to be used in executive decision making. 4 lectures.

GSB 577. Advanced Quantitative Business Analysis. 4 units

Term Typically Offered: TBD

Prerequisite: GSB 512 and OCOB graduate standing or approval from the Associate Dean.

The necessary conceptual framework of operations research techniques for solving key problems encountered while managing an enterprise. Concepts of linear programming, simulations, network models, inventory models, PERT/CPM, and forecasting techniques. 3 seminars, 1 laboratory.

GSB 583. Management of Human Resources. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

An overview of the major functional and support activities in the personnel/human resource field, including strategic human resource planning, job analysis, recruitment, selection, performance appraisal, compensation, employee rights, and employee safety and health. 4 seminars.

GSB 584. Corporate Financial Policy. 4 units

Term Typically Offered: TBD

Prerequisite: GSB 531 and OCOB graduate standing or approval from the Associate Dean.

An overview of the factors that affect corporate financial decisions, including firms' financing, investment and hedging policies. Factors included: taxes, transaction costs, contracting (between managers and shareholders, and between shareholders and other claimholders such as bondholders), and asymmetric information. 3 seminars, 1 activity.

GSB 585. Investment Portfolio Management. 4 units

Term Typically Offered: TBD

Prerequisite: GSB 531 and OCOB graduate standing or approval from the Associate Dean.

The application of financial theory to the problems of investment management. Topics cover the valuation of basic financial instruments, portfolio optimization, risk management, asset allocation, the CAPM, and market efficiency. Required use of optimization software and writing spreadsheet programs. 4 seminars.

GSB 587. International Financial Management. 4 units

Term Typically Offered: TBD

Prerequisite: GSB 531 and OCOB graduate standing or approval from the Associate Dean.

The international aspects of corporate finance and investing. Balance of payments, foreign exchange with emphasis on exchange rate determination, exchange risk, hedging, and interest arbitrage, international money and capital markets, international financing, and international banking. 4 seminars.

GSB 595. Managing Change. 4 units

Term Typically Offered: W

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

The knowledge and the elementary skills/competencies needed to intervene in an organization in order to improve its effectiveness. Design and use of action to improve organizational effectiveness. 4 seminars.

GSB 596. Economic Forecasting. 4 units

Term Typically Offered: TBD

Prerequisite: GSB 512, GSB 523 and OCOB graduate standing or approval from the Associate Dean.

Applications to business planning of selected economic forecasting techniques. Classical time series analysis, Box-Jenkins (ARIMA) models, leading indicators and input-output analysis. 3 seminars, 1 laboratory.

GSB 597. Seminar in Selected Economic Problems. 4 units

Term Typically Offered: TBD

Prerequisite: GSB 523 and OCOB graduate standing or approval from the Associate Dean.

Selected economic problems analyzed at an advanced level in a particular field, such as international trade, public finance, urban, industrial organization or transportation. 4 seminars.

Graduate Studies-Economics (GSE)

GSE Courses

GSE 500. Independent Study. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of department head.

Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition.

GSE 510. Essential Mathematics for Economic Analysis. 4 units

Term Typically Offered: SU

Prerequisite: Graduate standing. Recommended: MATH 206, MATH 244, or MATH 408.

Review and discussion of the basic math tools needed for graduate work in economics, including set theory, linear algebra, properties of functions, static and dynamic optimization. 4 lectures.

GSE 511. Microeconomic Analysis. 4 units

Term Typically Offered: F

Prerequisite: Concurrent enrollment in GSE 510 and graduate standing.

Basic microeconomic theory including theory of the firm, consumer theory, general equilibrium, capital theory, and welfare economics. 4 lectures.

GSE 512. Macroeconomic Analysis. 4 units

Term Typically Offered: W

Prerequisite: GSE 511 and graduate standing.

Basic macroeconomic theory including markets for commodities and credit, the demand for money, market-clearing and the labor market, inflation and interest rates, investment, real business cycles and unemployment, economic growth, government consumption and the role of public services, and taxes, transfers, and the public debt. 4 lectures.

GSE 518. Essential Statistics for Econometrics. 4 units

Term Typically Offered: SU

Prerequisite: Graduate standing. Recommended: MATH 206 or MATH 244 or GSE 510.

Statistical concepts for use in theoretical and applied econometric applications including random variables, independence, expectations, probability, distributions, covariance and correlation, large sample theory, and properties of estimators. 4 lectures.

GSE 520. Advanced Econometrics I. 4 units

Term Typically Offered: F

Prerequisite: GSE 518 and graduate standing. Recommended: ECON 339.

The use of statistical procedures to measure theoretical economic relationships and to verify and reject theories. Advanced coverage of regression analysis and hypothesis testing. 4 lectures.

GSE 522. Advanced Econometrics II. 4 units

Term Typically Offered: W

Prerequisite: GSE 520 and graduate standing.

Use of statistical procedures to deal with simultaneous equations, limited dependent variables and time-series data. Includes methods of instrumental variables, generalized method of moments and maximum likelihood. 4 lectures.

GSE 524. Computational Methods in Economics. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing.

Use of computers to solve economic problems. Topics include computer programming using econometric software, data gathering and organization, and numerical solution methods for economic problems. 4 lectures.

GSE 526. Microeconometrics. 4 units

Term Typically Offered: W

Prerequisite: GSE 520 and graduate standing. Recommended: GSE 524.

Variety of standard and advanced econometric techniques employed in applied microeconomics. Emphasis on when and how to apply appropriate techniques. 4 lectures.

GSE 532. Environmental and Natural Resource Economics. 4 units

Term Typically Offered: TBD

Prerequisite: GSE 511 and graduate standing.

Economic analysis of pollution, congestion, public good provision, and natural resource conservation. Static and dynamic efficiency, economic growth and sustainability, pollution taxes, marketable permits, and the design of market-based regulations. 4 lectures.

GSE 534. International Economics. 4 units

Term Typically Offered: TBD

Prerequisite: GSE 511 and graduate standing.

Analysis of the international movement of goods, services, capital and payments. The role of exchange rates, tariffs, quotas, and transport costs. Relationship between international trade and economic growth. 4 lectures.

GSE 536. Public Economics. 4 units

Term Typically Offered: TBD

Prerequisite: GSE 511 and graduate standing.

Economic analysis of the rationale for public expenditure and taxation. Externalities, pollution and public policy, income redistribution and public welfare, public goods, collective choice and political institutions, public budgeting techniques and cost-benefit analysis, taxation and tax policy, state-local finance and fiscal federalism. 4 lectures.

GSE 538. Industrial Economics. 4 units

Term Typically Offered: SP

Prerequisite: GSE 511 and graduate standing.

Economic theories of industrial organization with specific reference to such topics as cartels, market concentration and performance, vertical integration, franchise contracts, ownership and control of firms, multipart and discriminatory pricing, and tie-in sales. Economic aspects of antitrust law and government regulation of industry. 4 lectures.

GSE 542. Advanced Labor Economics. 4 units

Term Typically Offered: SP

Prerequisite: GSE 522 and graduate standing, or consent of instructor.

Recommended: GSE 526.

Research methods in labor economics and application of modern empirical techniques to the analysis of labor markets. Topics include labor supply and demand, discrimination, migration, and human capital accumulation. 4 lectures.

GSE 544. Evidence-Based Decision Analysis. 4 units

Term Typically Offered: SP

Prerequisite: GSE 520 and graduate standing. Recommended: GSE 524 and GSE 526.

Representing uncertainty using discrete and continuous conditional probabilities. Monte Carlo simulation of independent and correlated random variables. Optimization of decision variables. Randomization in program evaluation. Model mis-specification. Visualization and representation of the results of a decision analysis. Case studies. 4 lectures.

GSE 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

GSE 580. Seminar in Economics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Advanced topics in economics chosen according to the common interests and needs of the students enrolled. Schedule of Classes will list topic selected. 1-4 seminars. Total credit limited to 5 units.

GSE 599. Thesis. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of thesis committee.

Individual research under the general supervision of the faculty, leading to a graduate thesis of suitable quality. Minimum of 8 units required for degree.

Graphic Communication (GRC)

GRC Courses

GRC 101. Introduction to Graphic Communication. 3 units

Term Typically Offered: F

Graphic communication history, theory, processes, applications, and practices. New technologies that affect day-to-day communication including traditional and digital printing and publishing, and non-print imaging including Internet applications. Overview of design technology, web and digital media, printing and imaging management, graphics for packaging, industry segments. 3 lectures.

GRC 172. Introductory Applied Graphic Communication Processes. 2 units

Term Typically Offered: F, W, SP

Prerequisite: GRC 101; Graphic Communication majors and minors only.

Introduction to the application of theories and practice in University Graphic Systems as they apply to commercial printing, publication printing, digital media and graphic communication industries. 2 seminars.

GRC 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor; Graphic Communication majors only.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

GRC 201. Digital Publishing Systems. 3 units

Term Typically Offered: F, W

Prerequisite: Graphic Communication majors or Liberal Arts and Engineering majors with concentration in Publishing Technology.

Introduction to web, e-publishing, and print publishing systems including hardware, software, design considerations, and file formats. Overview of print output technologies, networking, web design, and digital publishing standards. 2 lectures, 1 laboratory.

GRC 203. Digital File Preparation and Workflow. 4 units

Term Typically Offered: F, W, SP

Prerequisite: GRC 101; GRC 201, and Graphic Communication major.

Terminology and techniques used in the creation of digital files and workflow systems for print and web. Workflow options including automation, proofing, and output systems will be discussed in addition to digital file delivery and transfer. 3 lectures, 1 laboratory.

GRC 204. Introduction to Contemporary Print Management and Manufacturing. 4 units

Term Typically Offered: W, SU

Prerequisite: GRC 101; Graphic Communication majors only.

Survey of management fundamentals and components relevant to graphic communication manufacturing, production, operations, and quality. Introduction to management theory and contemporary management trends and practices in the graphic communication industry. Course may be offered in classroom-based or online format. 4 lectures.

GRC 211. Substrates, Inks and Toners. 4 units

Term Typically Offered: F, W

Prerequisite: GRC 101; Graphic Communication majors or Liberal Arts and Engineering majors with concentration in Publishing Technology.

Technical aspects of paper, other substrates, inks, toners, and other printable materials used in the printing and packaging industries. Manufacture, application and interaction of these materials in relation to particular processes and end use requirements. Hands-on testing of materials in relation to quality, properties, and performance. 3 lectures, 1 laboratory.

GRC 212. Substrates, Inks and Toners: Theory. 3 units

Term Typically Offered: F, W

Prerequisite: GRC 101 and GRC minors only.

Technical aspects of paper, other substrates, inks, toners and other printable materials used in the printing and packaging industries. Manufacture, application, and interaction of these materials in relation to particular processes and end use requirements. Credit not allowed for GRC majors. 3 lectures.

GRC 220. Introduction to Applied Social Media in Graphic Communication. 2 units

Term Typically Offered: F, W, SP

Prerequisite: GRC 101; major or minor in GRC.

Practical application of social media tools used in the Graphic Communication industry. Students prepare social media marketing campaigns that require research, design, writing, and elementary analytics. Total credit limited to 6 units. 2 lectures.

GRC 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor; Graphic Communication majors only.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

GRC 301. Digital Photography and Color Management. 4 units

Term Typically Offered: F, W, SP

Prerequisite: GRC 203. Replaces GRC 202.

Digital photography for print and web, including lighting, exposure, composition, and photo retouching. Color measurement and the application of color management and quality assessment in the graphic communication industry. 3 lectures, 1 laboratory.

GRC 316. Flexographic Printing Technology. 3 units

Term Typically Offered: F, W

Prerequisite: GRC 211; Graphic Communication majors only.

Flexographic printing technology for flexible packaging, label printing, folding and corrugated cartons. Optimization of file preparation, plate imaging, and equipment settings. Specification and management of automated workflows. 2 lectures, 1 laboratory.

GRC 318. Digital Typography for Print and Web. 4 units

Term Typically Offered: F, W

Prerequisite: Junior standing; GRC 203; and GRC 301. Replaces GRC 218.

Application of typography using current software tools for print, web and digital publishing. In-depth study of communication principles and visual organization. Font technology and management for the creative, print and web publishing industries. 3 lectures, 1 laboratory.

GRC 320. Managing Quality in Graphic Communication. 4 units

Term Typically Offered: F, W

Prerequisite: GRC 328 and STAT 217; Graphic Communication majors only.

Theory and practices of quality management in the graphic communication industry. Quantifying customer expectations, specifications, standard operating procedures, SPC tools, and employee empowerment. Principles of Lean Management, Six Sigma, ISO, and Malcolm Baldrige. 3 lectures, 1 laboratory.

GRC 322. Advanced Digital Typography. 3 units

Term Typically Offered: F

Prerequisite: GRC 218; Graphic Communication majors only.

Advanced typographic principles relating to print and electronic media. Page layout and font management with consideration for electronic media. Applied problems focusing on typographic design, typographic application and file preparation, including web typography and eBook creation. 2 lectures, 1 laboratory.

GRC 324. Binding and Finishing Processes. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: GRC 101; Graphic Communication majors and minors only.

Imposition techniques, cutting, and folding. Stitch, case and perfect binding techniques and applications. Operational and aesthetic uses of die cutting, scoring, creasing, foil stamping and embossing techniques. 1 laboratory.

GRC 328. Offset Printing Technology. 4 units

Term Typically Offered: F, SP

Prerequisite: GRC 211 or GRC 212 and Graphic Communication majors only.

Offset printing and plate technology for commercial, publication, packaging and reprographic segments of the printing industry. Press configurations, materials, computerized press controls, workflow, pressroom management, coating and quality control. Folding structures, plate types, quality, and new technologies for offset printing. 3 lectures, 1 laboratory.

GRC 329. Printed Electronics. 3 units

Term Typically Offered: F

Prerequisite: GRC 328.

Introduction to printed electronics products, markets and technologies. Emphasis on printed and hybrid flexible electronics for functional and novel applications including marketing, packaging, displays, wearable and stretchable products. Various production methods with emphasis on gravure printing. 2 lectures, 1 laboratory.

GRC 331. Color Management and Quality Analysis. 4 units

Term Typically Offered: W

Prerequisite: Completion of GE Area B3 and either ART 182 or GRC 202.

The physics, psychology, measurement, analysis and management of color for print and electronic documents, including web sites. Practical application of color correction, color proofing, and production workflows that ensure the best possible color reproduction. 3 lectures, 1 activity.

GRC 337. Consumer Packaging. 3 units

Term Typically Offered: F, W

Prerequisite: GRC 301.

Problem-solving strategies for package printing that integrate concepts from marketing, design and technology. Package manufacturing, function, quality, visual appeal, sustainability, and economics are addressed. 2 lectures, 1 laboratory.

GRC 338. Web Development and Content Management. 4 units

Term Typically Offered: W, SP

Prerequisite: GRC 318 or GRC 218.

Web development production techniques including creating, repurposing, and managing assets for web publishing. Digital content management for tablet and mobile device publishing. 3 lectures, 1 laboratory.

GRC 339. Web Design and Production. 4 units

Term Typically Offered: F, SP

Prerequisite: GRC 338; Graphic Communication majors only.

Advanced design and production techniques for web development. Current software applications and technologies for user interface design, site structure and information architecture. 3 lectures, 1 laboratory.

GRC 357. Specialty Printing Technologies. 3 units

Term Typically Offered: F

Prerequisite: GRC 301; Graphic Communication majors only.

Specialty printing and imaging technologies used in fabric decorating, decals for marketing, industrial, and functional printing, security printing and various forms of packaging. Printing on various materials using special processes including screen printing, pad printing, sublimation printing, digital imaging, and post print finishing. 2 lectures, 1 laboratory.

GRC 361. Marketing and Sales Management for Print and Digital Media. 4 units

Term Typically Offered: F, SP

Prerequisite: GRC 101 and GRC 204; Graphic Communication majors only.

Identification and development of target markets for products and services in the graphic communication industry. Deployment of strategies in pricing, promotion and distribution management. Application of customer relationship management techniques for personal selling, forecasting and planning. 3 lectures, 1 laboratory.

GRC 372. Applied Graphic Communication Practices. 2 units

Term Typically Offered: F, W, SP

Prerequisite: GRC 101 and GRC 172; Graphic Communication majors only.

Application of theories and practices to University Graphic Systems as they apply to commercial printing, publication printing, digital media and graphic communication industries. Major credit limited to 2 units; total credit limited to 12 units. 2 seminars.

GRC 377. Web and Print Publishing. 4 units

GE Area F

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and completion of Area B.

Web and print publishing technology and its impact on society. The technologies of digital photography, typography, graphics, layout, and design for print and web publishing including decision-making considerations. The application of scientific and mathematical principles to web and print publishing technologies. 3 lectures, 1 laboratory. Fulfills GE Area F except for Graphic Communication majors.

GRC 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor; Graphic Communication majors only.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 2 units per quarter.

GRC 402. Digital Printing and Emerging Technologies in Graphic Communication. 3 units

Term Typically Offered: F, SP

Prerequisite: Graphic Communication major; and GRC 318.

Study of the theory, technology, economics and application of digital printing processes and variable data publishing. Explores digital printing technology, databases, and database publishing techniques. 2 lectures, 1 laboratory.

GRC 403. Estimating for Print and Digital Media. 4 units

Term Typically Offered: F, SP

Prerequisite: GRC 328; Graphic Communication majors only.

Estimating the cost of various print and digital products and services. Development of cost rates and production standards. Cost estimating methods for Print on Demand, VDP, sheetfed lithography, web development, and wide-format output. Analysis of material, labor and other cost factors. 3 lectures, 1 laboratory.

GRC 411. Strategic Trends and Profitability Issues in Print and Digital Media. 4 units

Term Typically Offered: W, SP

Prerequisite: GRC 403 and senior standing; Graphic Communication majors only.

Graphic communication industry market trends and strategic positioning. Strategies for successfully positioning a business. Paradigms and business practices for graphic communication companies. Company analysis using case studies. Innovative management practices in the graphic communication industry. 3 lectures, 1 activity.

GRC 420. Graphic Communication in Integrated Marketing Communications. 4 units

Term Typically Offered: SP

Prerequisite: BUS 453; and Senior standing.

Working with clients, participants will organize and demonstrate proficiency in the use of applicable Graphic Communication design, workflow and data-driven communication software and digital printing technologies using print and media software. GRC capstone for the Integrated Marketing Communications minor. 3 lectures, 1 laboratory.

GRC 421. Production Management for Print and Digital Media. 4 units

Term Typically Offered: W

Prerequisite: GRC 320; Graphic Communication majors only.

Application of management principles and production control methodologies for print and digitally-imaged products. Organization and financial analysis, decision-making, equipment and inventory planning, resource optimization, and the application of practiced and newly innovative contemporary world-class techniques for improving profitability in the graphic communication industry. 3 lectures, 1 activity.

GRC 422. Human Resource Management Issues for Print and Digital Media. 4 units

Term Typically Offered: F, W, SP

Prerequisite: GRC 403 and senior standing; Graphic Communication majors only.

Human resource management integrated into the success of graphic communication companies. A comprehensive management approach is utilized emphasizing employee development, training, promotion, and motivation. Conflict management, facilitation skills, team building empowerment, leadership, ethical and legal issues in the graphic communication industry. 3 lectures, 1 laboratory.

GRC 429. Digital Media. 3 units

Term Typically Offered: F, SP

Prerequisite: GRC 338; Graphic Communication majors only.

Current technologies and production tools used for digital media including mobile user interface design, prototyping, video, animation, and project management. Industry standards, digital rights management, file formats, and publishing options for digital media applications. Legal, ethical, and business issues surrounding digital media. 2 lectures, 1 laboratory.

GRC 439. Book Design Technology. 4 units

Term Typically Offered: W

Prerequisite: Senior standing, GRC 402; Graphic Communication majors only.

Advanced creative problem-solving strategies associated with the technologies used in book design and production. Advanced techniques in page layout, design, typography, type specification and image manipulation as they relate to output technology. Content, format and distribution of print and electronic books. 3 lectures, 1 laboratory.

GRC 440. Magazine Design Technology. 4 units

Term Typically Offered: SP

Prerequisite: Senior standing, GRC 402; Graphic Communication majors only.

Concept development and design for magazines and publications. Technical considerations as they relate to output technology and digital publishing. Application of organizational structures such as grids, formatting and sequential design. Advanced techniques in typography and image manipulation. Distribution of content for print and digital formats. 3 lectures, 1 laboratory.

GRC 451. Management Topics in Graphic Communication. 3 units

Term Typically Offered: TBD

Prerequisite: GRC 203; Graphic Communication majors and minors only.

Current trends and practices in select graphic communication management topics. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures.

GRC 452. Emerging Technologies in Graphic Communication. 3 units

Term Typically Offered: TBD

Prerequisite: GRC 203.

Current trends and practices in select graphic communication emerging digital topics. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures.

GRC 453. Design Reproduction Topics in Graphic Communication. 3 units

Term Typically Offered: TBD

Prerequisite: GRC 203.

Current trends and practices in select graphic communication design reproduction topics. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures.

GRC 461. Senior Project - Independent Study. 1-3 units

Term Typically Offered: TBD

Prerequisite: Senior standing; Graphic communication major; completion of GWR; and STAT 217 and consent of instructor.

Students will engage in collaborative projects in other disciplines without the constraint of a single quarter schedule. Formal presentation and report required. Minimum 90 hours of time. Total credit limited to 3 units.

GRC 462. Senior Project. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing; Graphic communication major; completion of GWR; and STAT 217 and consent of instructor.

Selection and completion of a culminating project. Projects typical of problems that graduates must solve in their fields of employment. Project results presented in formal report and presentation. 1 lecture, 2 activities.

GRC 463. Senior Project - Applied Practices. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing; Graphic communication major; completion of GWR; and STAT 217 and consent of instructor.

Opportunities in individual or group-based projects in Graphic Communication competitions and/or sponsored projects. Formal presentation and report required. 30 hours per unit. Total credit limited to 3 units. 1-3 activities.

GRC 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: GRC 101 and GRC 201 and Graphic Communication majors only.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

GRC 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor; Graphic Communication majors only.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

GRC 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor; Graphic Communication majors only.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 12 units. Credit/No Credit grading only.

GRC 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor; Graphic Communication majors only.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 12 units. Credit/No Credit grading only.

GRC 500. Special Problems in Graphic Communication for Graduate Students. 2 units

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Investigation, research, studies of problems in the graphic communication industry. Repeated course over four quarters working with University Graphic Systems, the Graphic Communication Institute at Cal Poly, and with individual faculty. Total credit limited to 8 units.

GRC 501. Survey of Functional Printing. 2 units

Term Typically Offered: TBD

Prerequisite: Consent of Printed Electronics and Functional Imaging Graduate Coordinator.

Foundations for emerging functional printing fields including printed electronics, active packaging, and security printing. Emphasis on processes, materials, electrical characterization, sensing, barrier properties, and anti-counterfeiting. Focus on applications including lighting, displays, novel electronics, energy harvesting, energy storage, sensors, scavengers, and brand security. Course offered online only. 2 lectures.

GRC 502. Orientation to Functional Printing. 2 units

Term Typically Offered: TBD

Prerequisite: Consent of Printed Electronics and Functional Imaging Graduate Coordinator.

Orientation and laboratory exploration for printed electronics, active packaging, and security printing. Introduction to curricula, lab activities, research opportunities, and the use of equipment. Active participation in laboratory experiments related to processes and materials. 1 lecture, 1 laboratory.

GRC 510. Materials for Functional Printing. 4 units

Term Typically Offered: TBD

Corequisite: GRC 501.

Study of functional materials including substrates, coatings, and inks. Focus on barrier and heat-stable substrates as well as conductive, semi-conductive, dielectric, transparent conductors, forensic, sensor, and other functional inks and coatings. Emphasis on rheology, morphology, sintering and annealing. Course offered online only. 4 lectures.

GRC 512. Printing and Coating Technologies. 4 units

Term Typically Offered: TBD

Corequisite: GRC 501.

Study of functional printing and coating technologies, including screen printing, flexography, gravure, ink jet, offset, slot die, blade coating and conventional deposition techniques. Course offered online only. 4 lectures.

GRC 514. Optical and Electrical Patterning. 4 units

Term Typically Offered: TBD

Corequisite: GRC 501.

Imaging technologies and processes for security, electronic, and active packaging printing. Focus on creating and evaluating images for applications in product security and electrical fabrication. Course offered online only. 4 lectures.

GRC 520. Functional Printing Product and Business Development. 4 units

Term Typically Offered: TBD

Prerequisite: GRC 501.

Principles of business and product development for electronic and functional applications. Focus on intellectual property rights, capital funding, entrepreneurship, and management of a technology business. Course offered online only. 4 lectures.

GRC 530. Functional Printing Workflows. 4 units

Term Typically Offered: TBD

Prerequisite: GRC 502.

Evaluation of advanced imaging technologies for functional printing applications. Imaging characteristics for ink/substrate combinations, focusing on print process attributes. Compensation for print characteristics. Enabling automated workflow technologies to improve throughput and minimize errors. 2 lectures, 2 laboratories.

GRC 551. Current Trends in Printed Electronics. 4 units

Term Typically Offered: TBD

Corequisite: GRC 502.

Current trends and practices in select printed electronics topics. Open to graduate students. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory.

GRC 552. Current Trends in Active Packaging. 4 units

Term Typically Offered: TBD

Corequisite: GRC 502.

Current trends and practices in select active packaging topics. Open to graduate students. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory.

GRC 553. Current Trends in Security and Anti-Counterfeiting. 4 units

Term Typically Offered: TBD

Corequisite: GRC 502.

Current trends and practices in select security and anti-counterfeiting topics. Open to graduate students. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures, 1 laboratory.

GRC 560. Research Methods in Printed Electronics and Functional Imaging. 2 units

Term Typically Offered: TBD

Corequisite: GRC 530.

Methods for conducting qualitative and quantitative evaluations, testing, and experimentation as well as writing investigative, scholarly research papers and theses in functional printing. Topics include qualitative research, descriptive research, experimental design, statistical analysis, writing styles, and publishing options. 1 lecture, 1 activity.

GRC 595. Cooperative Education Experience. 4-12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 12 units. Credit/No Credit grading only.

GRC 596. Research Project in Printed Electronics and Functional Imaging. 3 units

Term Typically Offered: TBD

Prerequisite: GRC 560.

Comprehensive research project in printed electronics and functional imaging. Communication of the results and findings of scholarly work in written report and by oral presentation.

Graduate Studies-Packaging (GSP)

GSP Courses

GSP 530. Packaging Value Chain. 2 units

Term Typically Offered: W, SU

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Packaging value chain from raw material supplier to retailers in the context of meeting current needs within the packaging arena. Global exploration of value chain strategies to increase innovation, sustainability, cost savings, quality, organizational agility, and responsiveness. Course offered online only. 2 lectures.

GSP 532. Packaging Materials. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean of OCOB. Corequisite: GSP 530.

Fundamental and physical properties of packaging materials. Processing of materials. Design and fabrication of packaging materials for efficient, economically viable and environmental sustainable product-package systems for global supply chain solutions. Course offered online only. 4 lectures.

GSP 533. Advanced Packaging Laws and Regulations. 3 units

Term Typically Offered: W

Prerequisite: OCOB graduate standing or approval from the Associate Dean. Corequisite: GSP 530.

Overview of packaging laws and regulations. Content ranges from FDA, USDA, FTC, and EPA concepts, to labeling and structural issues such as bio-terror, product security and environmental packaging to materials issues, litigation, international concepts and intellectual property issues. Course offered online only. 3 lectures.

GSP 535. Packaging Value in Logistics and Supply Chain Management. 3 units

Term Typically Offered: SU

Prerequisite: OCOB graduate standing or approval from the Associate Dean. Corequisite: GSP 530.

Integrated view of procurement, operations and logistics management. Management of the flow of products from raw material sourcing and acquisition through delivery to the final user. Capturing and understanding the value across these flows and how to increase it. Course offered online only. 3 lectures.

GSP 536. Packaging Design. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean. Corequisite: GSP 530.

Overview of structural and graphic design concepts for package design with focus on creating value throughout the entire packaging value chain. Topics include design thinking, innovation, design processes, two-dimensional and three-dimensional design elements, positioning, value creation, and distribution packaging considerations. Course offered online only. 4 lectures.

GSP 538. Quality Evaluation of Packaged Products. 4 units

Term Typically Offered: F

Prerequisite: OCOB graduate standing or approval from the Associate Dean. Corequisite: GSP 530.

Overview of the role of quality of packaged product and techniques used for testing and evaluating quality of consumer products as related to material quality assessment, product-package interaction and human-package interaction. Course is offered online only. 4 Lectures.

GSP 539. Marketing and Sales for Packaged Products. 4 units

Term Typically Offered: W

Prerequisite: OCOB graduate standing or approval from the Associate Dean. Corequisite: GSP 530.

Packaging as a means to increase sales of product. Package design, structure, materials and production costs. Exploration of color, imagery, sustainability, and recent trends. Course is offered online only. 4 lectures.

GSP 540. Quantitative Analysis for Packaging. 4 units

Term Typically Offered: SP

Prerequisite: OCOB graduate standing or approval from the Associate Dean. Corequisite: GSP 530.

Analytical and quantitative techniques. Summary measures, smoothing, interpolation curve fitting, root-finding, extrema. Numerical differentiation, integration. Boundary value problems. Numerical simulation. Course is offered online only. 4 lectures.

GSP 541. Corporate Finance for Packaging. 4 units

Term Typically Offered: SP

Prerequisite: OCOB graduate standing or approval from the Associate Dean. Corequisite: GSP 530.

Decisions with financial implications for firms' owners and stakeholders in the context of packaging. Choice of best packaging alternative from the financial standpoint. Course offered online only. 4 Lectures.

History (HIST)

HIST Courses

HIST 100. Introduction to the Study of History. 2 units

Term Typically Offered: F, W

Prerequisite: History major.

Introduction to the study of history, focusing on methods, topics, skills in the History major at Cal Poly, and internship and career opportunities. To be taken in the first year of study at Cal Poly. 2 seminars.

HIST 110. Western Civilization: Ancient to Renaissance. 4 units

Term Typically Offered: F, W

Beginnings of western civilization from the river valley societies of the Middle East, circa 3,000 BCE to the Renaissance in Western Europe to 1550 CE. Political, economic, social, intellectual, and artistic development of that period. 4 lectures.

HIST 111. Western Civilization: Reformation to the Present. 4 units

Term Typically Offered: W

Development of western civilization from 1550 CE to the present. Comparison of liberal modernization of the West with the conservative modernization in Central, East and Southeast Europe. Political, economic, social, intellectual, and artistic developments of that period. Particular attention to understanding dynamics that produce pluralistic mass societies such as Great Britain and France, and authoritarian mass societies such as Nazi Germany and the Soviet Union. 4 lectures.

HIST 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: F, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter.

HIST 201. United States History to 1865. 4 units

GE Area D1; USCP

Term Typically Offered: F, W, SP

Survey of the first half of U.S. history, including: contact and settlement, American Revolution, slavery, westward expansion, early California, Civil War, and California and U.S. Constitutions. Particular attention to how race, class, and gender shaped changing definitions of freedom and equality. Not open to students with credit in HIST 206 or HIST 207. 4 lectures. Crosslisted as HIST 201/HNRS 203. Fulfills D1 and USCP.

HIST 202. United States History Since 1865. 4 units

GE Area D1; USCP

Term Typically Offered: F, W, SP

Survey of the second half of U.S. history, including reconstruction, industrialization, the regulatory state, foreign affairs, and the remaking of citizenship rights and society. Particular attention to how race, class, and gender shaped changing definitions of freedom and equality. Not open to students with credit in HIST 206 or HIST 207. 4 lectures. Crosslisted as HIST/HNRS 202. Fulfills GE Area D1 and USCP.

HIST 206. American Cultures. 4 units

GE Area D1; USCP

Term Typically Offered: F, W, SP

The social, cultural, constitutional, and political history of African American, Asian American, Native American, European American, and Latino/a men and women. Not open to students with credit in HIST 201 or HIST 202. 4 lectures. Fulfills GE D1 and USCP.

HIST 207. Freedom and Equality in American History. 4 units

GE Area D1; USCP

Term Typically Offered: TBD

The multiple and conflicting ways in which various Americans (defined in terms of race, class and gender) have struggled to formulate and promote their own understandings of freedom and equality, from the pre-conquest era to the present. 4 lectures. Not open to students with credit in HIST 201 or HIST 202. Crosslisted as HIST/HNRS 207. Fulfills GE D1 and USCP.

HIST 208. Survey of California History. 4 units

USCP

Term Typically Offered: W

Survey of California history from the pre-Columbian period to the present. Native American culture, Spanish imperialism, the Mexican War, gold rush, immigration, dominance of the Southern Pacific Railroad, progressivism, growth of Los Angeles, and California's impact on national and world economy and politics. 4 lectures. Fulfills USCP.

HIST 210. World History I. 4 units

GE Area D3

Term Typically Offered: F, W, SP

Global history from the beginnings of organized agriculture to the Industrial Revolution. Focus on causation, using geography and cultural creation to highlight economic, political, social, and intellectual developments of the major civilizations of earth. Priority given to Liberal Studies majors. 4 lectures. Fulfills GE D3.

HIST 213. Modern Political Economy. 4 units

GE Area D2

Term Typically Offered: F, W, SP

The relationship between states and economies in the modern period. Themes of modernization, industrialization, and colonial expansion. The major theories of political economy, especially liberalism and socialism. 4 lectures. Crosslisted as HIST/HNRS 213. Fulfills GE D2.

HIST 214. Political Economy of Latin America and the Middle East. 4 units

GE Area D2

Term Typically Offered: F, W, SP

Comparative examination of socio-economic structures of the Middle East and Latin America in the framework of global economy. Analysis of the historical context of integration of these two regions in the international economic system and the local reactions to the effects of global forces on national structures. 4 lectures. Fulfills GE D2.

HIST 216. Comparative Social Movements. 4 units

GE Area D3

Term Typically Offered: F, SP

History of global social movements from the late nineteenth century to the present. May include, but not limited to: socialism, nationalism, feminism, fascism and communism, pacifism, life reform, gay liberation, indigenous peoples' movements, and environmentalism. Includes a service learning component. 4 lectures. Crosslisted as HIST/HNRS 216. Fulfills GE D3.

HIST 221. World History, Beginnings to 1000. 4 units

GE Area D3

Term Typically Offered: W, SP

History of world societies in comparative global perspective. Cross-cultural exchange, interaction, and conflict in the making of the world to 1000, concentrating on the rise of earliest human communities, growth of states, economic, political, and cultural transformations. 4 lectures. Fulfills GE D3.

HIST 222. World History, 1000 - 1800. 4 units

GE Area D3

Term Typically Offered: F, W

History of world societies in comparative global perspective. Cross-cultural exchange, interaction, and conflict in the making of the world to 1800, concentrating on the global interaction and integration, cultural and ecological exchange, economic, political, and cultural transformations. 4 lectures. Fulfills GE D3.

HIST 223. World History, 1800 - Present. 4 units

GE Area D3

Term Typically Offered: F, W, SP

Comparative history of Western and non-Western societies in global perspective. Cross-cultural exchange, interaction, and conflict in the making of the modern world, with focus on the economic, political, and cultural transformations that facilitated and emerged from imperialism. 4 lectures. Crosslisted as HIST/HNRS 223. Fulfills GE D3.

HIST 225. The World at War. 4 units

GE Area D3

Term Typically Offered: F, W

Comparative history of the causes and consequences of global warfare for diverse societies and individuals from prehistory to the present. Topics include the environment, technology, migration, economics, politics, religion, law, ethnicity, class, and gender as they relate to history of global warfare. 4 lectures. Fulfills GE D3.

HIST 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

HIST 303. Research and Writing Seminar in History. 5 units

Term Typically Offered: F, W, SP

Prerequisite: HIST 100 or History minor; completion of GE Areas A1 and A3 with a grade of C- or better.

Designed to develop student's ability to research and write an interpretive paper on a specific topic. Seminar participants practice the skills of library research, historical and historiographical analysis, and writing and revising. Paper in lieu of final examination. The Schedule of Classes will list topic selected. 4 lectures and research project.

HIST 304. Historiography. 4 units

Term Typically Offered: F, W, SP

Prerequisite: HIST 303; History major.

Theoretical approaches used to study the past, including scholarship on history and memory, the influence of interdisciplinary studies, the significance of race and gender as categories of analysis, and the place of history and the historian in contemporary society. 3 seminar meetings and research project.

HIST 306. The Witch-Hunts in Europe, 1400-1800. 4 units

GE Area D5

Term Typically Offered: W, SP

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and GE Area D3.

A history of the development of witchcraft ideas, persecutions, and skepticism in the western world from 1400 to 1800, focusing on the legal, economic, social, and intellectual currents that produced, fired, and eventually ended the phenomenon. 4 lectures. Fulfills GE D5 except for History majors.

HIST 307. European Thought 1800-2000. 4 units

GE Area D5

Term Typically Offered: W, SP

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from GE Area D1, D2 or D3.

Intellectual and cultural history of Europe from the nineteenth century to the present. Liberalism, radical thought, feminism, evolutionary theory, psycho-analysis, structuralism, existentialism, and postmodernism. 4 lectures. Fulfills GE D5 except for History majors.

HIST 308. The Trans-Atlantic Slave Trade. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from D2 or D3.

The African, Islam and Euro-American dimensions of the trans-Atlantic slave trade, with focus on its varying roots, organization and impact on cross-cultural and global levels. 4 lectures. Fulfills GE D5 except for History majors.

HIST 309. Cultures of West Africa and the African Diaspora. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from GE Area D2 or D3.

The cultures of West African and the African Diaspora, with special attention to the intersection of Animist, Islamic and Western cultures, and the survival of African cultures in the Americas as manifested in the artistic, religious, literary, and other humanistic legacies of the African Diaspora. 4 lectures. Fulfills GE D5 except for History majors.

HIST 310. East Asian Culture and Civilization. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from GE Area D2 or D3.

The pre-modern and modern histories of China and Japan. Focus on the traditional era, the transition to modernity, cultural uniqueness within East Asian civilization, and western images of Asia. 4 lectures. Crosslisted as HIST 310/HNRS 312. Fulfills GE D5 except for History majors.

HIST 314. Middle East. 4 units

Term Typically Offered: W

Prerequisite: Junior standing.

Political, social, and economic development of the Middle Eastern countries in the context of regional history and international politics since the birth of Islam. Particular attention to the resurgence of religious movements and their connection with nationalism and anti-colonialism in the region. 3 lectures and research project.

HIST 316. Modern East Asia. 4 units

GE Area D5

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from Area D2 or D3.

Modern histories of China, Japan and Korea: great disruptions of modernity that have transformed these societies, common characteristics of modernity in East Asia, great differences between Chinese, Japanese and Korean histories, and the mutually constitutive nature of these East Asian histories. 4 lectures. Fulfills GE D5 except for History majors.

HIST 317. The Lure of the Sea. 4 units

GE Area D5

Term Typically Offered: W, SP

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from Area D1, D2 or D3.

The history of the sea, people who travel across it, live alongside or in the midst of it, or simply seek it out. Topics include imperialism, maritime commerce, port cities, littoral societies, piracy, tourism, popular culture. 4 lectures. Crosslisted as HIST/HNRS 317. Fulfills GE D5 except for History majors.

HIST 318. The City in the Modern World. 4 units

GE Area D5

Term Typically Offered: F, SP

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from GE Area D1, D2 or D3.

Comparative history of social, economic, political, and cultural changes in urban life during the nineteenth and twentieth centuries. Topics may include but are not limited to: commerce and labor; disease and death; conservation and preservation; gender and sexuality; race and ethnicity. 4 lectures. Fulfills GE D5 except for History majors.

HIST 319. Modern South and Southeast Asia. 4 units

GE Area D5

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better and one course from Area D2 or D3.

Modern histories of South and Southeast Asia: traditional empires and cultures, spread of modern capitalism, Western and Japanese colonialism, decolonization and independence, ethnic and religious tensions, roles in contemporary economy and geopolitics. 4 lectures. Fulfills GE D5 except for History majors.

HIST 320. Colonial and Revolutionary America. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or History major; and completion of GE Area A with a grade of C- or better; and GE Area D1.

Settlement and evolution of British America, background to the imperial dispute, events leading to the Revolution, Articles of Confederation, Constitution, the national economy, roles of and impact on African-Americans, women, Native Americans and Loyalists. 4 lectures. Fulfills GE D5 except for History majors.

HIST 321. Civil War America. 4 units

GE Area D5

Term Typically Offered: F, SP

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and GE Area D1.

The experiences of nineteenth-century Americans. Focus on industrialization, antebellum reform, slavery, the Civil War battlefield and homefront, Reconstruction, and the creation of a New South. 4 lectures. Fulfills GE D5 except for History majors.

HIST 322. Modern America. 4 units

GE Area D5

Term Typically Offered: W, SP

Prerequisite: Junior standing or History major; and completion of GE Area A with a grade of C- or better; and GE Area D1.

American history since 1900. Focus on domestic and foreign policy interactions, struggle of disenfranchised groups for social and political equality, and changes in culture and identity. 4 lectures. Crosslisted as HIST 322/HNRS 323. Fulfills GE D5 except for History majors.

HIST 324. The Historical Novel in the United States, 1960s to the Present. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area D1.

An introduction to the historical novel as it has developed in the United States since the 1960s. Exploration of how historical novels typically represent the past and the ways in which they change our notion of what counts as 'history.' 4 lectures. Crosslisted as HIST/HNRS 324. Fulfills GE D5 except for History majors.

HIST 326. United States Foreign Relations since 1898. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and two courses from Area D1, D2, or D3.

Topics include imperialism, the world wars, the Cold War, decolonization, and globalization. Particular attention to ideologies shaping U.S. policy; ethics and decision-making at multiple levels; and political, economic, social, and cultural consequences of U.S. activity for societies and individuals around the world. 4 lectures. Fulfills GE D5 except for History majors.

HIST 334. Modern Europe, 1789-1914. 4 units

GE Area D5

Term Typically Offered: F

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and two courses from GE Area D1, D2 or D3. Recommended: HIST 111.

Europe's 'long nineteenth century' reveals continuity and dramatic changes in politics, social structures and identities, forms of cultural expression, and scientific and technological knowledge. Topics include the French and Industrial revolutions; liberalism; nationalism; socialism; modernism; imperialism; and World War I. 4 lectures. Crosslisted as HIST/HNRS 334. Fulfills GE D5 except for History majors.

HIST 335. Modern Europe, 1914-Present. 4 units

GE Area D5

Term Typically Offered: F

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and two courses from GE Area D1, D2 or D3. Recommended: HIST 111.

Examination of twentieth-century European history. Topics include: First World War, World Economic Crisis, communism, fascism, mass culture, shifting gender roles, Second World War, Cold War, Velvet Revolution, and the European Union. 4 lectures. Crosslisted as HIST/HNRS 335. Fulfills GE D5 except for History majors.

HIST 336. Britain at War: The British, the Americans and the Struggle for Freedom, 1939-1945. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and GE Area D1 and one course from D2 or D3.

Historical examination of Great Britain's challenge to its sovereignty and freedom by the regime of Nazi Germany from 1939-1945. An account of how Britain formed an alliance with the United States, and how that partnership forged a successful campaign that culminated in the survival of Britain and destruction of the Nazi regime. 4 lectures. Fulfills GE D5 except for History majors.

HIST 337. Colonial Latin America. 4 units

GE Area D5

Term Typically Offered: F, W

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one lower-division Area D course.

Survey of Latin American history in the colonial period from 1492 to the early nineteenth century. Special attention to the indigenous cultures, the Iberian civilization, and the evolving relationship between them. 4 lectures. Fulfills GE D5 except for History majors. Formerly HIST 339.

HIST 338. Modern Latin America. 4 units

GE Area D5

Term Typically Offered: F, W

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one lower-division Area D course.

Social, economic and political history of Latin America from the 19th century to the present. Historical development of economic structures and political and cultural institutions in the region, including Central America, the Hispanic Caribbean, and South America. 4 lectures. Fulfills GE D5 except for History majors. Formerly HIST 340.

HIST 341. Modern Central America. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Political, social, and economic development of Central American countries in the context of regional history and international politics during the nineteenth and twentieth Centuries. 3 lectures and research project.

HIST 350. The Scientific Revolution, c. 1500-1800. 4 units

GE Area D5

Term Typically Offered: F, W

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from GE Area D1, D2 or D3.
Recommended: One or more courses in GE Area B.

History of the intellectual, social, and cultural changes in the early modern period known as the 'Scientific Revolution.' Main topics include the Copernican Revolution, mechanical philosophy, natural history, and the social and material practices of early modern science. 4 lectures.
Crosslisted as HIST/HNRS 350. Fulfills GE D5 except for History majors.

HIST 354. History of Network Technology. 4 units

GE Area F

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or History major; completion of one course from GE Area B.

History of computer network technology from the Cold War to the present. Origins of the Internet, development of TCP/IP, growth of network democracy, encryption, race and gender in cyberspace, Usenet and hypertext. 4 lectures. Fulfills GE Area F.

HIST 359. Living in a Material World. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of one course from GE Area B.

Evolution of materials (ceramics, metals, polymers, composites, semiconductors) in the context of history. Traces the link between historical and technological developments enabled by materials from the Stone Age to the Electronic Age. 4 lectures. Crosslisted as HIST/MATE 359. Fulfills GE Area F.

HIST 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter.

HIST 401. Early America. 4 units

Term Typically Offered: W

Prerequisite: HIST 303 or graduate standing.

Age of exploration. European powers in eastern North America. English settlements, development of the English colonies, with emphasis on Virginia and Massachusetts. Proprietary interests, growth of internal control, and colonial conflicts. 3 lectures and research project.

HIST 402. American Revolution and the New Nation. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

Background to the imperial dispute, events leading to the Revolution, Articles of Confederation, Constitution, impact on the national economy, women, African-Americans, Loyalists, Native Americans. The Schedule of Classes will list topic selected. 3 lectures and research project.

HIST 405. African-American History to 1865. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

History of African Americans from the colonial period to the Civil War, roughly 1619-1865. The slave trade, slavery in the colonies, plantation slavery, the Black West, and free Black culture and institutions. 3 lectures and research project.

HIST 406. African-American History from 1865. 4 units

USCP

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

History of African-Americans from the Civil War to the present. Reconstruction, racial segregation, the Harlem Renaissance, the Great Migration, the Civil Rights Movement, Black Feminism and Black Power. 3 lectures and research project. Fulfills USCP.

HIST 407. Science and Society in Cold War America. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing and HIST 303; or Junior standing; ISLA 123; and completion of GE Area A3 with a grade of C- or better; or Graduate standing.

American science during the Cold War, including the development of weapons-related technologies, the effects of economic change and foreign policy, ethical debates among scientists, and shifting public perceptions of science. 3 lectures and research project.

HIST 408. The Age of Roosevelt: Depression and World War, 1929-50. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

Principle forces affecting the nation's political, social and economic life during the Age of Franklin Roosevelt. Included are the politics of the New Deal, government regulation of the economy and response to the Depression, the rise of the modern presidency, racial and ethnic conflict, the politics of class and gender, the home front at war and post-war tension. 3 lectures and research project.

HIST 409. Vietnam War at Home and Abroad. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

Interaction of revolutionary Vietnamese nationalism with U.S. foreign policy. Analysis of the conduct of the war. Assessment of the impact of the war on U.S. society. 3 lectures and research project.

HIST 413. Turbulent Decades: The United States in the 1960s and 1970s. 4 units

Term Typically Offered: SP

Prerequisite: HIST 303 or graduate standing.

Topics include liberalism, conservatism, civil rights, foreign policy, the war in Vietnam, stagflation and deregulation, and key social and cultural movements. Emphasis on politics, economic conditions, and ideology. 3 lectures and research project.

HIST 416. Modern Japan. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.

Japan's development as a modern state (1800-2000 CE). Themes include Japan's engagement with modernity and nationalism, the emperor system, Japanese imperialist expansion, and postwar reconstruction of Japanese society. 3 lectures and research project.

HIST 417. 20th Century China. 4 units

Term Typically Offered: F

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.

Chinese history in the twentieth century: the fall of the Qing Dynasty and founding of Republic of China in 1912, problems of imperialism and modernity, Chinese Communist Party and People's Republic of China since 1949. 3 lectures and research project.

HIST 418. Chinese Film and History. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.

Examination of 20th century Chinese history through the use of Chinese feature films. Films (with English subtitles) serve as main texts for understanding the tremendous changes in modern Chinese history, and the evolving relationships between film and Chinese society. 4 lectures.

HIST 419. Modern Southeast Asia. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.

Modern history of mainland and maritime Southeast Asia, focusing on the development of political institutions and changing political and cultural identities. Early empires, expansion of capitalism, colonial rule and wars through era of independence. 3 lectures and research project.

HIST 421. The History of Prostitution. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303; completion of GE Area D5; or graduate standing.

Comparative history of prostitution from antiquity to present. Analysis of prostitution from social, cultural, political, gendered and economic perspectives. 4 lectures. Crosslisted as HIST/WGS 421.

HIST 422. Japanese Postwar Film and History. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.
Recommended GE D5: HIST 316, HUM 310.

Relationships between film and postwar Japanese society; recurring themes and images that link the diverse body of postwar Japanese film. Films (with English subtitles) serve as main texts for understanding of the tremendous changes in recent Japanese history. 3 lectures, 1 activity.

HIST 423. The History of Vietnam. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.

The history of Vietnam and the influences on its national identities, including migration, cultural adaptations, temporality and territoriality, foreign influences, and racial formations within and outside of the borders of today's Vietnam. 3 lectures and research project.

HIST 424. Organizing and Teaching History. 4 units

Term Typically Offered: F

Prerequisite: Admission to teacher education program or valid teaching credential.

Organization, selection, presentation, application, and interpretation of subject matter in history in secondary schools. 4 seminars.

HIST 425. History-Social Sciences Student Teaching Seminar. 2 units

CR/NC

Term Typically Offered: SP

Prerequisite: HIST 424. Concurrent: EDUC 469 or EDUC 479.

Supervised practicum for part-time and full-time student teachers in the Social Science Credential Program. Teaching techniques and strategies useful for addressing a wide range of issues that arise in grades 6-12 social science classrooms. Credit/No Credit grading only. Total credit limited to 8 units. 2 seminars.

HIST 426. Imperial Russia. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

Political, social, intellectual and economic roots of Russian Absolutism. Emergence of Russia as an imperial power, reform, reaction and revolution - 1689-1914. 3 lectures and research project.

HIST 427. Soviet Russia. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

Transformation of Russian autocracy from tsarist to Bolshevik under the impact of World War I and the Revolution of 1917. The formative force of Marxism-Leninism; Civil War; the 'experimental' 20s; forced collectivization and industrialization; the Purges; 'engineering' a new Soviet Woman and Man for a new communist world; War: Second and Cold. 3 lectures and research project.

HIST 428. The Indian Ocean. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

History of the Indian Ocean from pre-Islamic times to the present. Exploration of unity and diversity of interconnected societies of the sea and shores of the Indian Ocean. Examination of geography, trade, travel, naval power and exploration in the political, religious, cultural, maritime and economic history of this vital region. 4 lectures.

HIST 429. Precolonial African History. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

Survey of African history from earliest times. Ancient African civilizations, Moslem penetration, the rise of indigenous kingdoms and the continuous impact of Atlantic slave trade. 3 lectures and research project.

HIST 430. Modern African History. 4 units

Term Typically Offered: SP

Prerequisite: HIST 303 or graduate standing.

Survey of African history in the 19th and 20th centuries including European colonialism, African resistance, the rise of African nationalism and problems since independence. 3 lectures and research project.

HIST 432. United States Environmental History. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

Consideration of major themes in human interactions with the environment from the colonial period to the present. Major topics include: changing subsistence systems; the environmental impact of industrialization; conservation and sustainability; and the rise of modern environmental movements. 3 lectures and a research project.

HIST 433. History of the American West, Southwest Borderlands, and California. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area D5 or HIST 303 (may be taken concurrently).

Historiographical and chronological survey since European contact. Emphasis on the frontier and borderlands concepts, Native America, the Hispanic Southwest, US expansion and conquest, industrial capitalism, inter-societal and transnational economies, immigration, public memory, and racial identity formation. 3 lectures and a research project.

HIST 434. American Women's History to 1870. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.

Female ideology and experience from the colonial period through the American Civil War. Use of a variety of sources, including women's own writing, in order to understand the history of women as it both reflects and shapes American culture and society. 3 lectures and research project. Crosslisted as HIST/WGS 434.

HIST 435. American Women's History from 1870. 4 units

USCP

Term Typically Offered: TBD

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.

The female past in the modern period of U.S. history. Considers how transformations in gender roles are reflective of other significant changes in American culture and society. Emphasis on class, race, and ethnic variations in women's experience. 3 lectures and research project. Crosslisted as HIST/WGS 435. Fulfills USCP.

HIST 437. Nazi Germany. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

Background of German Romantic Nationalism; national unification and defeat in World War I; the failure of Weimar Democracy and political radicalization; the Nazi political, economic, and social revolution 1933-1939. 3 lectures and research project.

HIST 440. Topics and Issues in the History of the United States. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

Selected topics and issues in United States history. Descriptive subtitles assigned to each course. The Schedule of Classes will list topic selected. May be repeated to 8 units. 3 lectures and a research project.

HIST 441. Topics and Issues in European History. 4 units

Term Typically Offered: W

Prerequisite: HIST 303 or graduate standing.

Selected topics and issues in European history. Descriptive subtitles assigned to each course. The Schedule of Classes will list topic selected. May be repeated to 8 units. 3 lectures and research project.

HIST 442. Topics and Issues in Latin American History. 4 units

Term Typically Offered: F

Prerequisite: HIST 303 or graduate standing.

Selected topics and issues in Latin American history. Descriptive subtitles will be assigned to each course. The Schedule of Classes will list topic selected. May be repeated to 8 units. 3 lectures and research project.

HIST 443. Topics and Issues in Asian History. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or completion of GE Area D5 or graduate standing.

Selected topics and issues in Asian history. Descriptive subtitles will be assigned to each course. The Schedule of Classes will list topic selected. May be repeated to 8 units. 3 lectures and research project.

HIST 444. Topics and Issues in African History. 4 units

Term Typically Offered: F

Prerequisite: HIST 303 or graduate standing.

Selected topics and issues in African history. Descriptive subtitles will be assigned to each course. The Schedule of Classes will list topic selected. May be repeated to 8 units. 3 lectures and research project.

HIST 445. Topics and Issues in Comparative History. 4 units

Term Typically Offered: F

Prerequisite: HIST 303 or graduate standing.

Selected topics and issues in comparative history. Descriptive subtitles will be assigned to each course. The Schedule of Classes will list topic selected. May be repeated to 8 units. 3 lectures and research project.

HIST 452. Renaissance and Reformation Europe. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

Europe from 1348 to 1620 CE, with topics including the urban milieu, Renaissance philosophy and artistic expression, the new prince, the educational revolution, the Renaissance Church, Martin Luther, Jean Calvin, and the monumental economic, social, and political changes of the sixteenth century. 3 lectures and research project.

HIST 453. Religious Wars and Absolutism. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

Europe from 1559 to 1715 CE, focusing on the Catholic-Protestant conflict, the rise of the Absolutist state (especially Louis XIV), the 'Crisis of the Seventeenth Century,' the Thirty Years War, the English Civil War and Cromwell, and the Newtonian Paradigm. 3 lectures and research project.

HIST 458. Gender and Sexuality in Modern Europe. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.

Social, economic, political, and cultural effects of changing gender systems in modern Europe, particularly but not exclusively with regard to sex and sexuality. 3 lectures and research project. Crosslisted as HIST/WGS 458.

HIST 459. Imperialism and Postcolonial Studies. 4 units

Term Typically Offered: W

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.

The history of imperialism and postcolonial studies and the influences of social, economic, and political impact of the empire system on indigenous people, cultures, economy, and politics. 3 lectures and research project.

HIST 460. Senior Project I. 2 units

Term Typically Offered: F, W, SP

Prerequisite: HIST 303; HIST 304; senior standing; and History major.

Completion of paper or creative project under faculty supervision. Must be historical in nature, investigate a question of significance, include an historiographical analysis, and make an argument based on primary and secondary sources. Take HIST 461 during a subsequent quarter.

HIST 461. Senior Project II. 2 units

Term Typically Offered: F, W, SP

Prerequisite: HIST 303, HIST 304; HIST 460; senior standing; and History major.

Completion of paper or creative project begun in HIST 460 under faculty supervision.

HIST 467. History Internship. 4-12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Junior standing, completion of HIST 303 with grade of B or better and consent of internship coordinator.

Supervised work experience using skills of the discipline of history in a public agency ranging from 12 to 36 hours per week. Interns work directly under the supervision of an employee of the agency and are subject to the professional responsibilities typical of the state. Total credit limited to 12 units. Credit/No Credit grading only.

HIST 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or graduate standing.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

HIST 475. Arabia and the Arab Gulf States. 4 units

Term Typically Offered: SP

Prerequisite: HIST 303 or graduate standing.

History of Arabia from pre-Islamic times to the present. Political, cultural, social and economic history of Oman, the United Arab Emirates, Qatar, Bahrain, Kuwait, Saudi Arabia and Yemen. Emphasis on regional connectivity, imperialism and the origins of modern Gulf nation states, and historical roots to contemporary problems in the region. 4 lectures.

HIST 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 12 units. Credit/No Credit grading only.

HIST 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 24 units. Credit/No Credit grading only.

HIST 500. Special Problems for Graduate Students. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing in History.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units.

HIST 504. Graduate Study in History. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing in History.

Weekly reading and discussion course on practical methods and theoretical approaches to the study and writing of history. 4 seminars.

HIST 505. Graduate Seminar in United States History. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing in History.

Intensive study of selected topics in United States history. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars.

HIST 506. Graduate Seminar in European History. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in History.

Intensive study of selected topics in modern European history. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars.

HIST 507. Graduate Seminar in East Asian History. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing in History.

Intensive study of selected topics in East Asian history. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars.

HIST 508. Graduate Seminar in Latin American History. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing in History.

Intensive study of selected topics in Latin American history. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars.

HIST 509. Graduate Seminar in African History. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in History.

Intensive study of selected topics in African history. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars.

HIST 510. Graduate Seminar in Comparative History. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing in History.

Intensive study of selective topics in comparative history. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 seminars.

HIST 512. Supervised Reading for Comprehensive Exams. 2 units

Term Typically Offered: F, W, SP

Prerequisite: HIST 504 and 12 units of graduate study.

Directed supervision of reading for MA comprehensive exams. Regular consultation between advisor and student. Total credit limited to 4 units.

HIST 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

HIST 599. Thesis. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing in History.

Directed supervision of MA thesis. Regular consultation between advisor and student. Course to be taken three times over three separate quarters; total credit limited to 9 units.

Honors (HNRS)

HNRS Courses

HNRS 100. Introduction to the Honors Community. 2 units

CR/NC

Term Typically Offered: TBD

Topics on sustainability, diversity, ethics, and transition to life at Cal Poly. Introduction to Honors Program opportunities. Mentoring and building community. Collaboration with local service organizations. For University Honors Program students only. Credit/No Credit grading only. 1 lecture, 1 activity.

HNRS 101. Public Speaking. 4 units

GE Area A2

Term Typically Offered: TBD

Introduction to the principles of public speaking. Practical experience in the development, presentation, and critical analysis of speeches to inform, to persuade, and to actuate. Not open to students with credit in COMS 102. 4 lectures. Crosslisted as COMS/HNRS 101. Fulfills GE A2; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A2.

HNRS 102. Principles of Oral Communication. 4 units

GE Area A2

Term Typically Offered: TBD

Introduction to the fundamentals and principles which underlie effective oral communication. Practical experience in various types of speaking situations: informative speaking, persuasive speaking, and panel discussion. Not open to students with credit in COMS 101. 4 lectures. Crosslisted as COMS/HNRS 102. Fulfills GE A2; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A2.

HNRS 112. Race, Culture and Politics in the United States. 4 units

GE Area D1; USCP

Term Typically Offered: SP

Introductory and interdisciplinary study of the ways that race and ethnicity are created by both historical processes and American institutional formation - specifically social, political, economic, legal and cultural institutions. Special attention paid to the interlocking systems of race, class, gender and sexuality. 4 lectures. Crosslisted as ES/HNRS 112. Fulfills GE D1 and USCP.

HNRS 131. General Physics I. 4 units

GE Area B3; GE Area B4

Term Typically Offered: TBD

Prerequisite: MATH 141 with grade C- or better and MATH 142 or MATH 182 (or concurrent enrollment); for ME and AERO students only. Recommended: High School Physics.

Fundamental principles of mechanics. Vectors, particle kinematics. Equilibrium of a rigid body. Work and energy, linear momentum, rotational kinematics and dynamics. Primarily for engineering students, and for students majoring in the physical sciences. Not open to students with credit in PHYS 141. 3 lectures, 1 laboratory. Crosslisted as HNRS/PHYS 131. Fulfills GE B3 & B4.

HNRS 132. General Physics II. 4 units

GE Area B3; GE Area B4

Term Typically Offered: TBD

Prerequisite: PHYS 131 or HNRS 131 or PHYS 141.

Oscillations, waves in elastic media, sound waves. Temperature, heat and the first law of thermodynamics. Kinetic theory of matter, second law of thermodynamics. Geometrical and physical optics. 3 lectures, 1 laboratory. Crosslisted as HNRS/PHYS 132. Fulfills GE B3 & B4.

HNRS 134. General Physics IA. 4 units

GE Area B3

Term Typically Offered: TBD

Prerequisite: MATH 141 with grade C- or better and MATH 142 or MATH 182 (or concurrent enrollment). Recommended: High School Physics.

Fundamental principles of mechanics. Vectors, particle kinematics. Equilibrium of a rigid body. Work and energy, linear momentum, rotational kinematics and dynamics. Primarily for engineering and science students. Not open to students with credit in PHYS 131. 4 lectures. Crosslisted as HNRS 134/PHYS 141. Fulfills GE B3.

HNRS 141. Calculus I. 4 units

GE Area B1

Term Typically Offered: TBD

Prerequisite: Completion of ELM requirement and passing score on Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 118 and high school trigonometry; or MATH 119.

Limits, continuity, differentiation. Introduction to integration. 4 lectures. Crosslisted as HNRS/MATH 141. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

HNRS 142. Calculus II. 4 units

GE Area B1

Term Typically Offered: TBD

Prerequisite: MATH 141 with a grade of C- or better or consent of instructor.

Techniques of integration, applications to physics, transcendental functions. 4 lectures. Crosslisted as HNRS/MATH 142. Fulfills GE B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE B1 course is required to fulfill GE Area B.

HNRS 143. Calculus III. 4 units

GE Area B1

Term Typically Offered: TBD

Prerequisite: MATH 142 with a grade of C- or better or consent of instructor.

Infinite sequences and series, vector algebra, curves. 4 lectures. Crosslisted as HNRS/MATH 143. Fulfills GE B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE B1 course is required to fulfill GE Area B.

HNRS 145. Reasoning, Argumentation, and Writing. 4 units

GE Area A3

Term Typically Offered: W, SP

Prerequisite: Completion of GE Area A1 with a grade of C- or better. Recommended: Completion of GE Area A2.

The principles of reasoning in argumentation. Examination of rhetorical principles and responsible rhetorical behavior. Application of these principles to written and oral communications. Effective use of research methods and sources. 4 lectures. Crosslisted as COMS/ENGL/HNRS 145. Fulfills GE A3; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A3.

HNRS 148. Reasoning, Argumentation and Professional Writing. 4 units

GE Area A3

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A1 with a grade of C- or better. Recommended: Completion of GE Area A2.

The principles of reasoning in professional writing. Discussion and application of rhetorical principles, both oral and written, in professional environments. Study of methods, resources and common formats used in corporate or research writing. 4 lectures. Crosslisted as ENGL/HNRS 148. Fulfills GE A3; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A3.

HNRS 149. Technical Writing for Engineers. 4 units

GE Area A3

Term Typically Offered: SP

Prerequisite: Completion of GE Area A1 with a grade of C- or better. For Engineering students only. Recommended: Completion of GE Area A2.

The principles of technical writing. Discussion and application of rhetorical principles in technical environments. Study of methods, resources and common formats used in corporate or research writing. 4 lectures. Crosslisted as ENGL/HNRS 149. Fulfills GE A3; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A3.

HNRS 161. Creating Sustainable Communities I. 2 units

GE Area D3

Term Typically Offered: F

Environmental, historical, and social dimensions of sustainability. Elements of sustainable communities in a local and global context. Resilience and systems thinking. Introduction to research skills. Developing community within the Honors Program. Includes a service learning component. For University Honors Program students only. 1 lecture, 1 activity. Upon completion of HNRS 161 and HNRS 162, a student will receive 4 units of GE credit for Area D3.

HNRS 162. Creating Sustainable Communities II. 2 units

GE Area D3

Term Typically Offered: W

Prerequisite: HNRS 161. Upon completion of HNRS 161 and HNRS 162, a student will receive 4 units of GE credit for Area D3.

Continuation of HNRS 161. Environmental, historical, and social dimensions of sustainability. Institutional views of sustainability. Environmental justice. Appropriate technology. Developing community within the Honors Program. Includes a service learning component. For University Honors Program students only. 1 lecture, 1 activity.

HNRS 163. Creating Sustainable Communities III. 2 units

Term Typically Offered: SP

Prerequisite: HNRS 162.

Continuation of HNRS 161 and 162. Implementation and assessment of a year-long community service project, initiative, or campaign. Project management and interpersonal communication. Developing community within the Honors Program. For University Honors Program students only. 1 lecture, 1 activity.

HNRS 200. Special Problems for Undergraduates. 1-2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor and Honors Program.

Individual investigation, research, projects, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading only.

HNRS 201. Survey of Economics. 4 units

GE Area D2

Term Typically Offered: TBD

Basic principles of microeconomics and macroeconomics. Emphasis on applications to current national and global economic issues. For majors requiring one quarter of economics. Not open to students having previous credit in ECON 222 or equivalent. 4 lectures. Crosslisted as ECON/HNRS 201. Fulfills GE D2.

HNRS 202. United States History Since 1865. 4 units

GE Area D1; USCP

Term Typically Offered: F

Survey of the second half of U.S. history, including reconstruction, industrialization, the regulatory state, foreign affairs, and the remaking of citizenship rights and society. Particular attention to how race, class, and gender shaped changing definitions of freedom and equality. Not open to students with credit in HIST 206 or HIST 207. 4 lectures. Crosslisted as HIST/HNRS 202. Fulfills GE Area D1 and USCP.

HNRS 203. United States History to 1865. 4 units

GE Area D1; USCP

Term Typically Offered: TBD

Survey of the first half of U.S. history, including: contact and settlement, American Revolution, slavery, westward expansion, early California, Civil War, and California and U.S. Constitutions. Particular attention to how race, class, and gender shaped changing definitions of freedom and equality. Not open to students with credit in HIST 206 or HIST 207. 4 lectures. Crosslisted as HIST 201/HNRS 203. Fulfills D1 and USCP.

HNRS 204. Introduction to Women's and Gender Studies in the United States. 4 units

GE Area D1; USCP

Term Typically Offered: TBD

Introduction to theories and research on how genders and sexualities in the US shape and are shaped by historical processes and US institutional formation - specifically social, political, economic, legal, cultural institutions. Emphasis on interlocking systems of gender, sexuality, race and class. 4 lectures. Crosslisted as HNRS 204/WGS 201. Fulfills GE Area D1 and USCP.

HNRS 207. Freedom and Equality in American History. 4 units

GE Area D1; USCP

Term Typically Offered: TBD

The multiple and conflicting ways in which various Americans (defined in terms of race, class and gender) have struggled to formulate and promote their own understandings of freedom and equality, from the pre-conquest era to the present. 4 lectures. Not open to students with credit in HIST 201 or HIST 202. Crosslisted as HIST/HNRS 207. Fulfills GE D1 and USCP.

HNRS 211. Engineering Statics. 3 units

Term Typically Offered: TBD

Prerequisite: MATH 241 (or concurrently), PHYS 131 or PHYS 141.

Analysis of forces on engineering structures in equilibrium. Properties of forces, moments, couples, and resultants. Equilibrium conditions, friction, centroids, area moments of inertia. Introduction to mathematical modeling and problem solving. Vector mathematics where appropriate. 3 lectures. Crosslisted as HNRS/ME 211.

HNRS 212. Global Origins of United States Cultures. 4 units

GE Area D3; USCP

Term Typically Offered: TBD

How the global dispersal of Europeans, Asians, and Africans, the hemispheric dispersal of Latin Americans, and the forced internal migration of Native Americans have contributed to American cultural heritage and the struggles for ethnic, class and gender equality, and justice. 4 lectures. Crosslisted as ES/HNRS 212. Fulfills GE D3 and USCP.

HNRS 213. Modern Political Economy. 4 units

GE Area D2

Term Typically Offered: TBD

The relationship between states and economies in the modern period. Themes of modernization, industrialization, and colonial expansion. The major theories of political economy, especially liberalism and socialism. 4 lectures. Crosslisted as HIST/HNRS 213. Fulfills GE D2.

HNRS 214. Engineering Dynamics. 3 units

Term Typically Offered: TBD

Prerequisite: MATH 241; ME 211 or ARCE 211.

Analysis of motions of particles and rigid bodies encountered in engineering. Velocity, acceleration, relative motion, work, energy, impulse, and momentum. Further development of mathematical modeling and problem solving. Vector mathematics where appropriate. 3 lectures. Crosslisted as HNRS 214/ME 212.

HNRS 216. Comparative Social Movements. 4 units

GE Area D3

Term Typically Offered: TBD

History of global social movements from the late nineteenth century to the present. May include, but not limited to: socialism, nationalism, feminism, fascism and communism, pacifism, life reform, gay liberation, indigenous peoples' movements, and environmentalism. Includes a service learning component. 4 lectures. Crosslisted as HIST/HNRS 216. Fulfills GE D3.

HNRS 223. World History, 1800 - Present. 4 units

GE Area D3

Term Typically Offered: TBD

Comparative history of Western and non-Western societies in global perspective. Cross-cultural exchange, interaction, and conflict in the making of the modern world, with focus on the economic, political, and cultural transformations that facilitated and emerged from imperialism. 4 lectures. Crosslisted as HIST/HNRS 223. Fulfills GE D3.

HNRS 230. Philosophical Classics: Knowledge and Reality. 4 units

GE Area C2

Term Typically Offered: F

Prerequisite: Completion of GE Area A with a grade of C- or better; or for PHIL majors GE Area A3 with a grade of C- or better. Recommended: PHIL 126.

Critical examination of primary philosophical texts, from the ancient and modern periods, with focus on the nature of reality and the sources and limits of human knowledge. 4 lectures. Crosslisted as HNRS/PHIL 230. Fulfills GE C2.

HNRS 231. Philosophical Classics: Ethics and Political Philosophy. 4 units

GE Area C2

Term Typically Offered: W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better; or for PHIL majors GE Area A3 with a grade of C- or better. Recommended: PHIL 126.

Readings from primary philosophical texts, from the ancient and modern periods, with focus on the identification, evaluation and contemporary relevance of the central ethical and political themes and arguments presented in them. Course may be offered in classroom-based or online format. 4 lectures. Crosslisted as HNRS/PHIL 231. Fulfills GE C2.

HNRS 232. Masterworks of British Literature from the Late 18th Century to the Present. 4 units

GE Area C1

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A with a grade of C- or better.

Broadly surveys Romantic, Victorian, Modern, and Contemporary British literature in an historical-cultural context. Investigates works from several genres and a variety of national and cultural voices. May include such writers as Wordsworth, Wollstonecraft, Dickens, G. Eliot, Wilde, Woolf, Yeats, and Gordimer. 4 lectures. Crosslisted as ENGL 231/HNRS 232. Fulfills GE C1.

HNRS 241. Calculus IV. 4 units

Term Typically Offered: TBD

Prerequisite: MATH 143.

Partial derivatives, multiple integrals, introduction to vector analysis. 4 lectures. Crosslisted as HNRS/MATH 241.

HNRS 242. American Literature: 1830 to the Present. 4 units

GE Area C1

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A with a grade of C- or better.

A broad survey of later American literature from the rise of literary nationalism to the present. A wide range of writers and genres, including novels, short stories, poems, plays, essays, and autobiographies. Not open to students with credit in ENGL 240. 4 lectures. Crosslisted as ENGL/HNRS 242. Fulfills GE C1.

HNRS 244. Linear Analysis I. 4 units

Term Typically Offered: TBD

Prerequisite: MATH 143.

Separable and linear ordinary differential equations with selected applications; numerical and analytical solutions. Linear algebra: vectors in n-space, matrices, linear transformations, eigenvalues, eigenvectors, diagonalization; applications to the study of systems of linear differential equations. 4 lectures. Crosslisted as HNRS/MATH 244.

HNRS 251. Great Books I: Introduction to Classical Literature. 4 units

GE Area C1

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A with a grade of C- or better.

Examination of the ancient epics and classical literature of Mesopotamia, Greece, and Rome. May include such readings as The Epic of Gilgamesh, the Iliad, the Odyssey, Genesis, Exodus, Antigone, the Symposium, the Aeneid, and Marcus Aurelius's Meditations. 4 lectures. Crosslisted as ENGL/HNRS 251. Fulfills GE C1.

HNRS 261. Leadership: Self Evaluation. 1 unit

Term Typically Offered: F, W, SP

Recommended: Sophomore standing.

Interpersonal leadership and communication skills with a focus on self evaluation. Personality assessment, preparation of a personal leadership development plan, and goal setting. Values and moral development. For University Honors Program students only. 1 activity.

HNRS 262. Leadership: Group Dynamics. 1 unit

Term Typically Offered: W

Prerequisite: HNRS 261.

Teamwork and team building skills with a focus on group dynamics. Understanding the effects of diversity on team dynamics and performance. Cross-cultural communication and leadership. Development of trust, feedback, and conflict resolution. For University Honors Program students only. 1 lecture.

HNRS 263. Leadership: Coaching and Mentoring. 1 unit

Term Typically Offered: SP

Prerequisite: HNRS 262.

Strategies for effective coaching and mentoring. Servant leadership, recognition of motivational sources in others, and positive psychology in leadership. Development of a leadership philosophy. For University Honors Program students only. 1 lecture.

HNRS 265. Research and Information Skills for Honors Students. 2 units

Term Typically Offered: W, SP

Prerequisite: HNRS 162.

Identifying information resources and research support services available through Kennedy Library. Methods, best-practices, and ethical standards related to planning, carrying out, summarizing, and publishing scholarly research. Written, oral, and visual presentation of research findings. For University Honors Program students only. 1 lecture, 1 activity.

HNRS 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

HNRS 299. Honors Group Seminar. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Students in the Honors Program are required to take at least eight courses for honors credit before graduation. Taking an Honors course may not be possible due to scheduling conflicts or unavailability of courses. This course allows students to engage in honors-level work in a standard, non-honors course on a group basis. Credit/No Credit grading only. Total credit limited to 4 units; repeatable in same term. Must achieve a B or better in the related standard course. 1 seminar.

HNRS 302. The Learn By Doing Lab Teaching Practicum. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Completion of GE Area B.

Early teaching experience in an informal science, technology, engineering, and mathematics (STEM) teaching and learning environment. Principles of inquiry-driven STEM education, lesson design, implementation and assessment. Intended for undergraduates exploring STEM teaching as a career. Total credit limited to 4 units. Credit/No Credit grading only. 1 seminar, 1 laboratory. Crosslisted as ENGR 322/SCM 302/HNRS 302.

HNRS 303. Economics of Poverty, Discrimination and Immigration. 4 units

GE Area D5; USCP

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and ECON 201 or ECON 222.

Economic analysis of the cause, extent and impact of poverty, discrimination and immigration and of the policies designed to address these socioeconomic issues. Emphasis on the experience of African-Americans, Latinos, and women in the United States. 4 lectures. Crosslisted as ECON/HNRS 303. Fulfills GE D5 except for Economics majors. Fulfills USCP.

HNRS 304. Values and Technology. 4 units

GE Area C4

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course from GE Area C.

Humanistic investigation into the theoretical and practical applications of technology with specific reference to the social effects of technological change. For all majors. Non-technical. 4 lectures. Crosslisted as HNRS 304/ISLA 303. Fulfills GE C4.

HNRS 310. Air and Space. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and Completion of GE Area B.

Technological innovations that have led to modern aircraft and spacecraft as viewed from an historical perspective. Development of aerodynamics, propulsion systems, light-weight structures, and control systems. How aviation has affected, and been affected by, history. Impact of aviation on society, including civil and military aircraft/spacecraft. Federal regulation of aviation, including air traffic control and airlines. Future developments in air and space technology. 4 lectures. Crosslisted as AERO/HNRS 310. Fulfills GE Area F.

HNRS 311. Computers for Poets. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B.

How computers and computer devices work. Introduction to software systems and applications. How computers connect with various media including images, speech and data. How information is encoded and transmitted across networks. Relationship between the computer and human information processing. 4 lectures. Crosslisted as CSC 310/HNRS 311. Fulfills GE Area F.

HNRS 312. East Asian Culture and Civilization. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from GE Area D2 or D3.

The pre-modern and modern histories of China and Japan. Focus on the traditional era, the transition to modernity, cultural uniqueness within East Asian civilization, and western images of Asia. 4 lectures. Crosslisted as HIST 310/HNRS 312. Fulfills GE D5 except for History majors.

HNRS 317. The Lure of the Sea. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from Area D1, D2 or D3.

The history of the sea, people who travel across it, live alongside or in the midst of it, or simply seek it out. Topics include imperialism, maritime commerce, port cities, littoral societies, piracy, tourism, popular culture. 4 lectures. Crosslisted as HIST/HNRS 317. Fulfills GE D5 except for History majors.

HNRS 320. Topics and Issues in Values, Media and Culture. 4 units

GE Area C4

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of one of the following: GE Area C1, C2 or C3. Recommended: Completion of GE Area C1 or C3.

The interplay of values, media, and culture from an interdisciplinary perspective. Descriptive subtitles assigned to each course. The Schedule of Classes will list topic selected. 4 lectures. Total credit limited to 8 units with different subtopic; repeatable in same term. Crosslisted as HNRS/ISLA 320. Fulfills GE C4.

HNRS 321. Undergraduate Research Methods and Practice. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A with a grade of C- or better; GE Area B1; and consent of instructor.

Research methods and tools for sciences and humanities, including formulating a research question, designing a study, using the scientific method to conduct and analyze surveys, and analyzing data. Emphasis on working in interdisciplinary research teams. Total credit limited to 8 units. 2 lectures, 2 activities. Crosslisted as HNRS/UNIV 321.

HNRS 322. Leadership and Project Management. 2 units

Term Typically Offered: TBD

Prerequisite: Junior standing in an engineering program.

Theory and practice in leadership and project management skills for engineering design teams. Basic issues related to, and tools used for, managing projects and concepts comprising project management. Emphasis on situations requiring resolutions and management decisions by groups representing various elements of an enterprise. 2 lectures. Crosslisted as HNRS/IME 322.

HNRS 323. Modern America. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or History major; and completion of GE Area A with a grade of C- or better; and GE Area D1.

American history since 1900. Focus on domestic and foreign policy interactions, struggle of disenfranchised groups for social and political equality, and changes in culture and identity. 4 lectures. Crosslisted as HIST 322/HNRS 323. Fulfills GE D5 except for History majors.

HNRS 324. The Historical Novel in the United States, 1960s to the Present. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area D1.

An introduction to the historical novel as it has developed in the United States since the 1960s. Exploration of how historical novels typically represent the past and the ways in which they change our notion of what counts as 'history.' 4 lectures. Crosslisted as HIST/HNRS 324. Fulfills GE D5 except for History majors.

HNRS 332. British Literature in the Age of Enlightenment: 1660-1798. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

In-depth exploration of the dominant themes and preoccupations of the Age of Enlightenment. Historical and cultural contexts of canonical and non-canonical literature emphasized to illustrate 18th century Britons' views of themselves and their changing world. May include such writers as Dryden, Behn, Defoe, Swift, Pope, and Johnson. 4 lectures. Crosslisted as ENGL/HNRS 332. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

HNRS 333. British Literature in the Age of Romanticism: 1798-1832. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

In-depth exploration of the literature of the British Romantic period. Cultural, historical, and philosophic contexts will also be examined in both canonical and non-canonical works. May include such writers as Blake, Wordsworth, Keats, and Wollstonecraft. 4 lectures. Crosslisted as ENGL/HNRS 333. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

HNRS 334. Modern Europe, 1789-1914. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and two courses from GE Area D1, D2 or D3. Recommended: HIST 111.

Europe's 'long nineteenth century' reveals continuity and dramatic changes in politics, social structures and identities, forms of cultural expression, and scientific and technological knowledge. Topics include the French and Industrial revolutions; liberalism; nationalism; socialism; modernism; imperialism; and World War I. 4 lectures. Crosslisted as HIST/HNRS 334. Fulfills GE D5 except for History majors.

HNRS 335. Modern Europe, 1914-Present. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and two courses from GE Area D1, D2 or D3. Recommended: HIST 111.

Examination of twentieth-century European history. Topics include: First World War, World Economic Crisis, communism, fascism, mass culture, shifting gender roles, Second World War, Cold War, Velvet Revolution, and the European Union. 4 lectures. Crosslisted as HIST/HNRS 335. Fulfills GE D5 except for History majors.

HNRS 336. Social Ethics. 4 units

GE Area C4; USCP

Term Typically Offered: TBD

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Examination of contemporary moral problems, solutions to these problems, and the arguments for these solutions, with emphasis on two or more of the following sample problem areas: abortion, suicide and euthanasia, capital punishment, family ethics, race relations, social justice, war, women's issues. 4 lectures. Crosslisted as PHIL 335/HNRS 336. Fulfills GE C4 except for Philosophy majors. Fulfills USCP.

HNRS 338. Critical Issues in American Politics. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course from GE Area D1 (POLS 112 recommended).

Examination of significant social, legal, economic and political issues that face the country and how the basic institutions of government-national, state, local-are responding to them; assessment of policies to correct these problems. 4 lectures. Crosslisted as HNRS/POLS 338. Fulfills GE D5 except for Political Science majors.

HNRS 340. Sexuality Studies. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course from lower division Area D.

Sexuality in a cultural and historical context. Changing definitions of human subjectivity. The cultural and social regimes that control and create sexuality (including the 'invention' of homo/heterosexuality and the social, legal and political systems that define sexual ab/normality). Contemporary issues of sexual orientation and topics of sexuality in relation to gender and race. 4 seminars. Crosslisted as WGS/HNRS 340. Fulfills GE D5.

HNRS 341. The Literary Sources of the American Character: 1865-1914. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Analysis of literary Realism and Naturalism in their cultural and historical contexts. May include such writers as Whitman, Dickinson, Twain, Chopin, James, Wharton, Dreiser, Norris, and Crane who are seen to accommodate the sense of danger, doubt, and disorder of the time. 4 lectures. Crosslisted as ENGL/HNRS 341. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

HNRS 342. The Literary Sources of the American Character: 1914-1956. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

The writers of the modern period and those of the early post-modern age, including writers marked by stylistic innovation and a willingness to challenge traditionally accepted standards. May include such writers as Hemingway, Fitzgerald, Stein, Hughes. 4 lectures. Crosslisted as ENGL/HNRS 342. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

HNRS 343. Multiple Voices of Contemporary American Literature. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

In-depth study of American fiction, poetry, and drama written since 1956. How contemporary literature examines enduring American themes and breaks new ground with the inclusion of diverse voices. 4 lectures. Crosslisted as ENGL/HNRS 343. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

HNRS 345. Women Writers of the Twentieth Century. 4 units

GE Area C4; GWR; USCP

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

In-depth exploration of works of 20th century women authors within their historical and cultural contexts. Analysis of canonical and non-canonical writing by women of differing classes, races, ethnicities, and sexual preferences. Literary techniques through which texts reflect or challenge such cultural constructs as gender, identity, sexuality, motherhood, etc. The emergence of a female literary tradition. May include such writers as Woolf, Rich, Kingston, Yamamoto, Morrison, Cervantes. 4 lectures. Crosslisted as ENGL/HNRS 345. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

HNRS 347. African American Literature. 4 units

GE Area C4; GWR; USCP

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

The writings of African Americans from the end of the eighteenth century to the present. Individual works and literary trends among African Americans of various periods and contexts: intellectual, political, and cultural. 4 lectures. Crosslisted as ENGL/HNRS 347. Fulfills GE C4 except for English majors. Fulfills USCP. Fulfills GWR for students with junior standing (90 units).

HNRS 350. The Scientific Revolution, c. 1500-1800. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or History major; completion of GE Area A with a grade of C- or better; and one course from GE Area D1, D2 or D3. Recommended: One or more courses in GE Area B.

History of the intellectual, social, and cultural changes in the early modern period known as the 'Scientific Revolution.' Main topics include the Copernican Revolution, mechanical philosophy, natural history, and the social and material practices of early modern science. 4 lectures. Crosslisted as HIST/HNRS 350. Fulfills GE D5 except for History majors.

HNRS 352. Modern Drama. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Reading and analysis of world drama of the last 150 years, thereby enhancing student awareness of modern culture, history, ethics, politics, and the human condition. Design work, multi-media forms, art, music, and cinema as components or informing elements of the works under consideration. 4 lectures. Crosslisted as ENGL/HNRS 352. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

HNRS 353. Gender, Race, Culture, Science and Technology. 4 units

GE Area F; USCP

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area B.

Interdisciplinary examination of the complex relationships between gender, race, culture, science, technology in educational, work, knowledge production, policy, and ethical contexts. Topics may include reproductive, medical, genetic, and emerging technologies and exploration of efforts to create more socially responsible science/technology. 3 lectures, 1 activity. Crosslisted as ES 350/HNRS 353/WGS 350. Fulfills GE Area F and USCP.

HNRS 361. Honors Track - Research, International, and Community Service Experience. 1 unit

Term Typically Offered: W, SP

Recommended: HNRS 265.

Completion of an approved Honors experience track in research, international study, or community service. Personal reflection on the experience. Peer evaluation. Presentation of the experience to the Honors and greater Cal Poly communities. For University Honors Program students only. 1 lecture.

HNRS 380. Literary Themes. 4 units

GE Area C4; GWR

Term Typically Offered: TBD

Prerequisite: Junior standing or English major; completion of GE Area A with a grade of C- or better; and completion of GE Area C1.

Literature selected according to a particular theme. Emphasis on critical interpretation, aesthetic appreciation, and historical and cultural contexts. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Crosslisted as ENGL/HNRS 380. Fulfills GE C4 except for English majors. Fulfills GWR for students with junior standing (90 units).

HNRS 391. Appropriate Technology for the World's People: Development. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and two courses from GE D1-D4.

A broad overview of international development and appropriate design for sustainability. Besides traditional classroom work, students work in teams to address problems with technical solutions. Collaboration with mentors from the university, private sector, and nonprofits serves to provide diverse background and project mentorship. 4 lectures. Crosslisted as HNRS/PSC/UNIV 391. Fulfills GE D5.

HNRS 392. Appropriate Technology for the World's People: Design. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B, or graduate standing. Recommended: UNIV 391, GE Area D2, and GE Area D3.

Addresses the needs of international impoverished communities with technological solutions, which are inexpensive, ecologically sustainable, and socially appropriate. Group study of target communities, and design and construction of an appropriate technology prototype. Not open to students with credit in PSC/UNIV/HNRS 492. 3 lectures, 1 laboratory. Crosslisted as HNRS/PSC/UNIV 392. Fulfills GE Area F.

HNRS 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of Honors Program Director.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

HNRS 411. New Media Arts I. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing; and completion of GE Area A with a grade of C- or better.

Advanced-level presentation of new media theory, design and practice. Topics covered include, but are not limited to, interactivity theory, user-centered system design, cognitive psychology, media analysis, and basic web design theory. Total credit limited to 8 units. 4 lectures. Crosslisted as ENGL/HNRS 411.

HNRS 412. New Media Arts II. 4 units

Term Typically Offered: TBD

Prerequisite: ENGL 411.

Advanced level of work with the primary technologies and design/critique theories currently at use in the professional creation of new media works. Lectures and readings expand upon material presented in ENGL 411. 4 lectures. Crosslisted as ENGL/HNRS 412.

HNRS 424. Design of Museum Displays of Science, Engineering and Technology. 4 units

Term Typically Offered: TBD

Prerequisite: GE Area B.

The design and creation of educational museum displays that highlight science, engineering, and technology. Projects done by multidisciplinary teams and for clients in the community. Emphasis on design, teamwork, service learning and project management. 3 lectures, 1 laboratory. Crosslisted as HNRS/UNIV 424.

HNRS 450. Solar Photovoltaic System Engineering. 4 units

Term Typically Offered: TBD

Prerequisite: one of the following: PHYS 104; PHYS 118; PHYS 121; or PHYS 141; and junior standing.

Engineering principles, design, and installation of solar photovoltaic power systems including grid-tie and off-grid systems. Photonic energy conversion, solar module engineering, solar power electronics, photovoltaic site planning, mechanical and structural considerations, permit processes, government incentives, and analysis of financial and investment issues. Field trips required. 3 lectures, 1 laboratory. Crosslisted as BRAE/EE/HNRS 450.

HNRS 461. Honors Capstone Seminar. 1 unit

CR/NC

Term Typically Offered: W, SP

Corequisite: Major-specific senior project.

Forum for graduating seniors to share their Honors experiences. Presentation and defense of a capstone project or experience before a diverse group of subject experts and laypersons. Seminars on communication and career guidance. For University Honors Program students only. Credit/No Credit grading only. 1 seminar.

HNRS 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

HNRS 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

HNRS 475. Sustainable Forest and Environmental Practices. 12 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area B and consent of instructor.

Recommended: Junior or senior standing.

Typical modules related to sustainable forest management, ecosystem sampling and inventory methods, photo interpretation, hydrologic resources, road condition, project impact analysis, best management practices. Topics covered vary from term to term depending on the priority for learning modules. Residency at Swanton Pacific and extended field trips required. 8 lectures, 4 activities. Crosslisted as HNRS/NR 475.

HNRS 492. Appropriate Technology for the World's People: Design. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B, or graduate standing. Recommended: UNIV 391, GE Area D2, and GE Area D3.

Addresses the needs of international impoverished communities with technological solutions, which are inexpensive, ecologically sustainable, and socially appropriate. Group study of target communities, and design and construction of an appropriate technology prototype. Seminar paper required. Not open to students with credit in PSC/UNIV/HNRS 392. 3 lectures, 1 laboratory. Crosslisted as PSC/UNIV 492.

HNRS 499. Honors Group Seminar. 1 unit

CR/NC

Term Typically Offered: TBD

Students in the Honors Program are required to take at least eight courses for honors credit before graduation. Taking an Honors course may not be possible due to scheduling conflicts or unavailability of courses. This course allows students to engage in honors-level work in a standard, non-honors course on a group basis. Credit/No Credit grading only. Total credit limited to 4 units, repeatable in same term. Must achieve a B or better in the related standard course. 1 seminar.

Honors Contract (HNRC)

HNRC Courses

HNRC 199. Honors Contract. 0 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Student must be in good standing in the Honors Program, and have permission of the Director.

Students in the Honors Program are required to take at least eight courses for honors credit before graduation. Taking an Honors course may not be possible due to scheduling conflicts or unavailability of courses. In these cases and with the permission of the Director of the Honors Program, the student may enter into a 'Contract' to engage in honors-level work in a class on an individual basis. Credit/No Credit grading only. Students can register for a maximum of 2 Honors Contracts; repeatable in same term.

HNRC 200. Honors Leadership Experience. 0 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Student must be in good standing in the Honors Program, and have permission of the Director.

The Honors Program encourages its students to develop leadership skills through serving on the Honors Board, chairing Honors Committees, or by participating in other approved leadership activities. To receive Honors credit for these activities, students must also participate in a number of formal leadership-training seminars/workshops, and contribute their insights to the Honors and greater Cal Poly communities. Credit/No Credit grading only. Total credit limited to two courses.

HNRC 399. Honors Contract. 0 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Student must be in good standing in the Honors Program, and have permission of the Director.

Students in the Honors Program are required to take at least eight courses for honors credit before graduation. Taking an Honors course may not be possible due to scheduling conflicts or unavailability of courses. In these cases and with the permission of the Director of the Honors Program, the student may enter into a 'Contract' to engage in honors-level work in a class on an individual basis. Credit/No Credit grading only. Students can register for a maximum of 2 Honors Contracts; repeatable in same term.

HNRC 400. Honors Professional, Social and Global Experience. 0 unit
CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Student must be in good standing in the Honors Program, and have permission of the Director.

The Honors Program encourages its students to enhance their academic coursework by broadening their professional, social and global perspectives through professional internships/co-ops, participation in community projects and study abroad experience. To receive Honors credit, students must also reflect on these experiences and contribute their insights through presentations (oral and/or written) to the Honors and greater Cal Poly communities. Credit/No Credit grading only. Total credit limited to two courses, repeatable in the same term.

Industrial Technology and Packaging (ITP)

ITP Courses

ITP 137. Electrical/Electronic Systems. 4 units

Term Typically Offered: TBD

Electrical and electronic circuit fundamentals. Essential information for technical managers regarding the theory and of AC and DC circuits and devices in manufacturing and electronic products. Understanding of inductance, capacitance, resistance, and integrated circuit components. Decision and problem solving skills developed. 3 lectures, 1 laboratory. Formerly IT 137.

ITP 150. Industrial Power Systems. 4 units

Term Typically Offered: F, W, SP

A survey of various industrial power systems including electrical, electronics, mechanical, fluid power and thermal power systems. Labs include fundamentals of electrical/electronic circuits and fluid power systems. 3 lectures, 1 laboratory. Formerly IT 150.

ITP 211. Industrial Safety and Quality Program Leadership. 4 units

Term Typically Offered: F, W

Prerequisite: ITP 150.

Effective program development and leadership to implement safety and quality process improvement. Application of industrial leadership, knowledge, skills and methods to develop and implement total safety and quality management programs. Class project includes the oral presentation. 3 lectures, 1 activity. Formerly IT 311.

ITP 233. Product Modeling and Communication. 4 units

Term Typically Offered: F, W, SP

Fundamental theory and practice of digital modeling with emphasis on hands-on use of two dimensional and three dimensional modeling software commonly used in industry. Includes part/assembly modeling, geometric dimensioning/tolerancing and fundamental skills in communicating product design data in accordance with industry standards. 2 lectures, 2 activities. Formerly IT 233.

ITP 234. Packaging Design Fundamentals. 4 units

Term Typically Offered: F

A comprehensive overview of fundamental structural and graphic concepts for package design. Focus on design thinking, two-dimensional and three-dimensional form creation, design elements, visual perception, photo rendering, and rapid prototyping. 3 lectures, 1 laboratory.

ITP 260. Manufacturing Processes and Materials. 4 units

Term Typically Offered: W, SP

Prerequisite: CHEM 111 or CHEM 124 or CHEM 127.

Introduction to a wide variety of manufacturing processes and materials with emphasis on metallic products. Analysis of relationships among manufacturing processes, materials and product design. Provides experiential learning on safe and efficient operations of manufacturing equipment. 3 lectures, 1 laboratory. Formerly IT 260.

ITP 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures. Formerly IT 270.

ITP 275. Industrial Facility Systems and Equipment. 4 units

Term Typically Offered: SP

Prerequisite: ITP 150. Corequisite: ITP 211.

Develop an understanding of contemporary issues in modern industrial facilities. Emphasis on support systems and equipment such as heating and cooling; material handling; electrical, hydraulic, pneumatic power systems; and energy management. Includes facilities sustainability and lean practices. 3 lectures, 1 activity.

ITP 302. Developing and Presenting New Enterprise Strategies. 4 units

Term Typically Offered: W

Prerequisite: Completion of GE Area A2 with a grade of C- or better; and BUS 346.

Taking new industrial enterprise concept to launch. Planning and management of product-based start-up including integration of: product development; manufacturability and costs; outsourcing; channel selection; supply chain; inventory and scheduling. Application to project case study. Emphasis on developing effective technical presentations. 2 lectures, 2 activities. Formerly IT 402.

ITP 303. Lean Six Sigma Green Belt. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: STAT 217, STAT 218, STAT 251, or any 300 or 400 level statistics course.

Develop skills to function as lean six sigma leader. Discussion and problem sessions cover lean six sigma green belt body of knowledge: define, measure, analyze, improve, control. Team skills necessary to complete projects. Course offered in in-class and online formats. 4 lectures. Formerly IT 303.

ITP 326. Product Design and Development. 4 units

Term Typically Offered: F, SP

Prerequisite: ITP 233 or BUS 310.

Overview of user-centered design methods involving sketching and quick prototyping techniques for new product development. Topics include: design thinking, identification of user needs, concept generation/selection/testing, industrial design, visual perception, ergonomics, sustainable design, product architecture, and intellectual property. 3 lectures, 1 laboratory. Formerly IT 326.

ITP 329. Industrial Materials. 4 units

Term Typically Offered: TBD

Prerequisite: CHEM 110 or CHEM 111 or equivalent, and junior standing.

Structure, properties, applications and limitations of select industrial materials to include ferrous and nonferrous metals, ceramics, glasses, composites, and organic materials. Materials testing and material selection. 3 lectures, 1 activity. Formerly IT 329.

ITP 330. Packaging Fundamentals. 4 units

GE Area F

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing or Industrial Technology and Packaging major; and completion of GE Area B3 via a course in physics (PHYS), Honors Contract physics (HNRS), or physical science (PSC).

Overview of packaging development, functions, and materials. Processes and technology protecting goods through supply chain. Container types, package design, development, research and testing. Economic and international importance and perspective as industrial activity. Packaging and the environment, and laws affecting packaging. 3 lectures, 1 laboratory. Fulfills GE Area F. Formerly IT 330.

ITP 341. Packaging Polymers and Processing. 4 units

GE Area F

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or Industrial Technology and Packaging major; and completion of GE Area B3 via college level CHEM.

Physical and chemical properties of plastic materials, processing techniques, recycling, laws and regulations. Evaluation of materials and technologies to reduce waste, improve reuse and recycling. Laboratory with common industry processes emphasizes relationships among processing, structure, and properties, and consumer interaction to specifications. 3 lectures, 1 laboratory. Fulfills GE Area F. Formerly IT 341.

ITP 371. Supply Chain Management in Manufacturing and Services. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: A grade of C- or better, or consent of instructor, in: MATH 141 or MATH 221, and STAT 217 or STAT 218 or STAT 251 or any 300 or 400 level statistics course.

Introduction to supply chain management and performance metrics. Supply or value chains dealing with hard goods and services from design to daily management. Project management techniques and technology for making and implementing decisions. 4 lectures. Formerly IT 371.

ITP 390. Industrial Automation. 4 units

Term Typically Offered: F, W

Prerequisite: ITP 233 and ITP 260.

Automated manufacturing systems, including computer numerical control (CNC), robotics, computer-integrated manufacturing, assembly and packaging. Hands-on activities in manual/automatic programming/operation of CNC machines, robots and programmable logic controllers. 2 lectures, 2 activities. Formerly IT 390.

ITP 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Formerly IT 400.

ITP 403. Lean and Quality Systems Management. 4 units

Term Typically Offered: F, W

Prerequisite: ITP 303; Business majors must have formally declared their concentration to enroll.

Process improvement and quality assurance viewed from systems perspective including cost, time, and process. Lean thinking and tools studied as problem solving approach achieving continuous improvement through waste elimination and variability reduction. Projects improve processes in manufacturing, supply chain or service. 4 lectures. Formerly IT 403.

ITP 406. Industrial Sales. 4 units

Term Typically Offered: F, SP

Prerequisite: BUS 346.

Technical competencies in industrial selling and purchasing through application of process management as it relates to sales, marketing and customer service. Includes guest speakers and team-based projects with local business organizations, individual and team product presentations with written proposals. 4 lectures. Formerly IT 406.

ITP 408. Paper and Paperboard Packaging. 4 units

Term Typically Offered: W

Prerequisite: ITP 330.

Physical and chemical properties, manufacture, conversion and use of paper, paperboard, corrugated board and related components. Design, use and evaluation of packages made from these materials. Survey of tests and procedures for paper based packaging materials and packaging products following ASTM, TAPPI, and ISO standards. 3 lectures, 1 laboratory. Formerly IT 408.

ITP 409. Packaging Machinery and Processes. 4 units

Term Typically Offered: W

Prerequisite: ITP 330.

Integrated study of packaging machinery and processes from a practical and operational viewpoint. Understanding basic processes and interrelationship between packaging machinery and type of product, production layout and efficiency, material handling and distribution equipment, quality control and ancillary systems. 3 lectures, 1 activity. Formerly IT 409.

ITP 410. Operations Planning and Control. 4 units

Term Typically Offered: F, W

Prerequisite: BUS 391; and ITP 303 or ITP 371.

Linking supply chain operations to deliver value to the end customer. Contrasting of advanced manufacturing concepts, such as pull systems, sales and operations planning, mixed model manufacturing, level production, and theory of constraints to traditional materials requirements planning systems. 3 lectures, 1 activity. Formerly IT 410.

ITP 411. Packaging Sustainability. 4 units

Term Typically Offered: F

Prerequisite: ITP 330.

A comprehensive overview of cradle-to-cradle sustainability concerns that apply to the packaging life cycle, tools for measuring & reporting sustainability and communicating sustainability initiatives. 3 lectures, 1 laboratory.

ITP 412. Instrumental Analysis of Packaging Polymers. 4 units

Term Typically Offered: W

Prerequisite: ITP 341.

Overview of various analytical methods and tools used for the evaluation of polymers and other packaging materials including thermal characterization, spectroscopy, chromatography. Qualitative and quantitative analysis of the matter. Identification of polymeric materials and morphology. Mass transfer measurement. 3 lectures, 1 laboratory.

ITP 413. Packaging Quality Assessment. 4 units

Term Typically Offered: SP

Prerequisite: ITP 341 and ITP 408.

Overview of the role that packaging quality plays in consumer packaged goods. Techniques used for testing and evaluating the quality of consumer product packaging, including material quality assessment, product-package interaction and human-package interaction. 3 lectures, 1 laboratory.

ITP 414. Packaging Laws & Regulations. 4 units

Term Typically Offered: W

Prerequisite: ITP 408 and ITP 411.

Overview of packaging laws and regulations. Content ranges from FDA, USDA, FTC, and EPA concepts, to labeling and structural issues such as bioterror, product security and environmental packaging, to materials issues, litigation, international concepts and intellectual property issues. 4 lectures.

ITP 415. Supply Chain and Logistics. 4 units

Term Typically Offered: SP

Prerequisite: One of the following: ITP 303, ITP 326, ITP 330, or ITP 341; and ITP 371.

Key concepts, tools, and approaches for making effective supply chain and logistics decisions in support of business goals. Practical management issues and applications are the focus rather than theoretical, mathematical optimization. Business cases and simulations are used to illustrate and explore best practices. 4 lectures. Formerly ITP 415.

ITP 419. Cooperative Education/Internship. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Approval of area chair, junior standing, and a CPSLO cumulative GPA of at least 2.5 without being on academic probation.

Work experience in business, industry, government and other areas of student career interest. Periodic written progress reports, final report, and evaluation by work supervisor required. Total credit limited to 4 units. Formerly ITP 419.

ITP 428. Commercialization of New Technologies. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ITP 326 or BUS 342 or BUS 346 and BUS 212 or BUS 214.

Concepts, frameworks, and experiences necessary to understand the business potential of technology innovations and determine if one or more sustainable market opportunities can be identified to exploit them. Hands-on exercises and real new inventions to illustrate concepts. 4 lectures. Formerly ITP 428.

ITP 430. Healthcare Packaging. 4 units

Term Typically Offered: W

Prerequisite: ITP 330.

Study of packaging systems for pharmaceuticals, nutraceuticals, and medical devices. Characteristics and properties of materials, forms, and sterilization methods. Design principles for products for healthcare. Laboratory exercises on packaging operations, materials, and evaluation methods. International and federal regulations and standards. Field trip may be required. 3 lectures, 1 laboratory. Formerly ITP 430.

ITP 457. Radio Frequency Identification in Supply Chain Management. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area B3 via a course in physics (PHYS), Honors Contract physics (HNRS), or physical science (PSC); and MATH 141 or MATH 221.

An overview of Radio Frequency Identification (RFID) technology from the managerial standpoint. Developing simple RFID solutions using development kits. 2 lectures, 2 laboratories. Formerly ITP 457.

ITP 461. Senior Project I. 2 units

Term Typically Offered: F

Prerequisite: Consent of instructor.

Selection and completion of a project under faculty supervision. Projects typical of problems graduates must solve in their field of employment. Project results presented in a formal report, and must be completed in two quarters. Minimum 120 hours total time. Formerly ITP 461.

ITP 462. Senior Project II. 2 units

Term Typically Offered: W

Prerequisite: Consent of instructor.

Selection and completion of a project under faculty supervision. Projects typical of problems graduates must solve in their field of employment. Project results presented in a formal report, and must be completed in two quarters. Minimum 120 hours total time. Formerly ITP 462.

ITP 464. Applied Industrial Technology Senior Project Seminar. 4 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Selection and analysis of industrial and technological problems and opportunities in directed individual or group-based projects. Problems typical to those which graduates could encounter in their fields of employment. Formal report required. Minimum 120 hours of total time. 4 seminars. Formerly ITP 464.

ITP 467. Applied Business Operations. 4 units

Term Typically Offered: F, SP

Prerequisite: ITP 211, ITP 233, ITP 260, ITP 326 and BUS 346.

An integrative experience replicating a manufacturer's business/production systems, including the design, fabrication, processing, quality control, resource management, cost-control, marketing, sales and packaging functions. Focus of instruction methodology on the development of the student's comfort with ambiguity and change inherent in business/production systems. Builds upon the foundational concepts developed throughout the Industrial Technology curriculum. 2 lectures, 2 laboratories. Formerly IT 407.

ITP 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study and seminars in selected topics in industrial technology. Open to undergraduate students. Class Schedule will list topic selected. Total credit limited to 12 units. 1 to 4 lectures. Formerly IT 470.

ITP 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Formerly IT 471.

ITP 475. Packaging Performance Testing. 4 units

Term Typically Offered: SP

Prerequisite: ITP 330.

Survey of tests and procedures for packaging materials and packaging products following ASTM and ISTA standards. The testing procedures include tests for shock, vibration, drop and impact as prescribed for shipment by truck, rail, sea, and air. Hands-on product/packaging testing for quality control. 3 lectures, 1 laboratory. Formerly IT 475.

ITP 485. Packaging Development. 4 units

Term Typically Offered: SP

Prerequisite: ITP 330, ITP 341, ITP 408, and ITP 475.

Development of industrial and consumer goods packaging concept to marketplace. Interplay of design for marketing, production and distribution. Development of package for market and consumer performance. Domestic and international case with examination of performance, economic and social factors. Class project. 3 lectures, 1 activity. Formerly IT 435.

ITP 500. Individual Study. 1-6 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing and formal petition with approval from the Associate Dean.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Maximum of 6 units may be applied to degree requirements. Formerly IT 500.

ITP 532. Technology Entrepreneurship. 4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

An understanding of the technology entrepreneurship processes by which new and innovative technologies are developed, embodied in products and/or services, brought to market, financed, and yield significant company growth. Focus on the technology startup experience, which has become a critical ingredient in national competitiveness as well as the career path of many former IT students. 2 lectures, 2 laboratories. Formerly IT 532.

ITP 537. Distribution Packaging for Business Managers. 4 units

Term Typically Offered: SU

Prerequisite: OCOB graduate standing or approval from the Associate Dean of OCOB.

Physical properties of distribution packaging and equipment used in prototyping and testing of product-packaging systems for global supply chains. Application of packaging knowledge to solve distribution packaging problems in modern business, with a view towards costs and environmental sustainability. Course is offered online only. 4 lectures.

ITP 545. Advanced Product Design and Development. 4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Product design and development using current CAD modeling systems and rapid prototyping technologies. Comprehensive simulation of the product development life cycle from initial concept to completed prototype. Applications of three-dimensional modeling and rapid prototyping techniques to support product development from concept to completion. 2 lectures, 2 laboratories. Formerly IT 545.

ITP 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Directed group study of selected topics for advanced students. Open to undergraduate students. The Schedule of Classes will list title selected. Total credit limited to 16 units. 1-4 seminars. Formerly IT 570.

ITP 571. Selected Advanced Topics Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Directed group laboratory study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 16 units. 1-4 laboratories. Formerly IT 571.

ITP 591. Applied Industry Project I. 5 units

Term Typically Offered: SP

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Initiation, completion and presentation of an individual project, involving research, allowing an opportunity to apply knowledge, skills, and competencies to address a significant issue in the field of packaging value chain, preferably in connection with the student's employment. Formerly IT 591.

ITP 592. Applied Industry Project II. 3 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Initiation, completion and presentation of an individual project, involving research, allowing an opportunity to apply knowledge, skills, and competencies to address a significant business issue in the field of industrial technology, preferably in connection with the student's employment. As part of ITP 591 a formal written project proposal must be accepted and approved by the Industrial Technology Area Chair before work begins. Formerly IT 592.

ITP 599. Industrial and Technical Studies Thesis. 3 units

Term Typically Offered: TBD

Prerequisite: OCOB graduate standing or approval from the Associate Dean.

Completion of a thesis involving individual research that is significant to the field of industrial and technical systems. A formal written proposal must be accepted by the Associate Dean of OCOB Graduate Programs before work begins. Course satisfies culminating experience requirement through the completion of the comprehensive thesis. Total credit limited to 9 units. Formerly IT 599.

Industrial and Manufacturing Engineering (IME)

IME Courses

IME 101. Introduction to Industrial and Manufacturing Engineering. 1 unit

Term Typically Offered: F

Introduction of major topics in industrial and manufacturing engineering. Time management, study skills and class scheduling necessary for academic success. University services. Professional ethics. Career opportunities review. 1 laboratory.

IME 130. Technical Foundations. 2 units

CR/NC

Term Typically Offered: TBD

Introduction to visualization, sketching, and drafting. Basic hand-tools, shop practices, and materials. Clearances and fits, threads and fasteners. Safety. Open to all majors. Credit/No Credit grading only. 1 lecture, 1 laboratory.

IME 140. Graphics Communication and Modeling. 2 units

Term Typically Offered: F

Introduction to computer-aided drafting and modeling of solid objects. Visualization and sketching for engineers. Communication of design information to manufacturing using pictorials, orthographic projection, section views, and auxiliary views. Manufacturing tolerances. 1 lecture, 1 laboratory.

IME 141. Manufacturing Processes: Net Shape. 1 unit

Term Typically Offered: F,W,SP,SU

Metal casting as a net shape process in manufacturing. Properties of molding materials and methods of casting. Introduction to rapid prototyping. Pattern and casting design principles. 1 laboratory.

IME 142. Manufacturing Processes: Materials Joining. 2 units

Term Typically Offered: F,W,SP,SU

Theory and application of metal cutting and welding processes. Includes shielded metal arc, flux cored arc, submerged arc, gas metal arc, gas tungsten arc, brazing, resistance, and oxy-acetylene processes. Bonding theory, joint design, codes and testing. Introduction to adhesive bonding. Open to all majors. 1 lecture, 1 laboratory.

IME 143. Manufacturing Processes: Material Removal. 2 units

Term Typically Offered: F, W, SP

Uses, capabilities, and theoretical and operational characteristics of lathe and milling machine tools, including conventional, automatic and numerical control. Cutting tool characteristics, machining parameters, quality control, and production methods. Design considerations for manufacturing. Introduction to robotics and automation. Open to all majors. 1 lecture, 1 laboratory.

IME 144. Introduction to Design and Manufacturing. 4 units

Term Typically Offered: F,W,SP,SU

Recommended: IME 140 or ME 129.

Supplemental review of visualization, sketching, and drafting fundamentals. Computer-aided solid modeling of parts and assemblies. Introduction to conventional machining processes on lathes and mills, computer numerical control, quality control, production methods, and design for manufacturing. Open to all majors. 2 lectures, 2 laboratories.

IME 156. Basic Electronics Manufacturing. 2 units

Term Typically Offered: F, W, SP

Practical electronics manufacturing knowledge expanded through concepts such as CAD/CAM design, Design for Manufacture (DFM), documentation requirements, prototyping and production planning. Hands-on techniques learned for project planning, soldering, automation, hand tool usage and production methods. 1 lecture, 1 laboratory.

IME 157. Electronics Manufacturing. 4 units

Term Typically Offered: TBD

Printed circuit board assembly; printed circuit board fabrication process; electronics packaging; overview of semiconductor manufacturing; design, documentation and fabrication of electronic units with emphasis on CAD/CAM. Open to all majors. 2 lectures, 2 laboratories.

IME 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

IME 223. Process Improvement Fundamentals. 4 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 141. Recommended: IME 101.

Principles of work simplification and motion analysis. Recording of work flow and methods. Process improvement through work measurement and standards, time study, synthetic data, predetermined time systems and work sampling. Allowances and performance rating, productivity measures. Introduction to lean manufacturing principles. Client based project. 3 lectures, 1 laboratory.

IME 239. Industrial Costs and Controls. 3 units

Term Typically Offered: F, W, SP

Prerequisite: IME 223.

Estimation of manufacturing costs for production planning, cost analysis, and cost control. Planning, budgeting, and control processes. Costs, accounting data and analysis of variances for managerial control, inventory valuation, and decision making. Techniques of pricing, cost estimating and cost reduction, and activity-based costing. 3 lectures.

IME 240. Additional Engineering Laboratory. 1-2 units

Term Typically Offered: TBD

Total credit limited to 4 units, with a maximum of 2 units per quarter. 1 or 2 laboratories.

IME 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

IME 301. Operations Research I. 4 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 244.

Systems modeling methodology, mathematical model formulations, linear programming, graphical and simplex methods. Sensitivity analysis. Integer and binary programming. Transportation, transshipment, assignment, and other network optimization models. Computer applications. 3 lectures, 1 activity.

IME 303. Project Organization and Management. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing, IME 314 or equivalent.

Design and implementation of a major industrial/business systems project. Project planning considerations. Motivational and influence techniques used in project management. Scheduling techniques with risk assessment. Resource leveling and management under constraints. Reducing project duration. Monitoring progress with earned value analysis. Project audit and closure. Planning and implementation of a project. Application of project management software. 3 lectures, 1 laboratory.

IME 305. Operations Research II. 4 units

Term Typically Offered: F, W, SP

Corequisite: IME 301 or STAT 321.

Stochastic decision analysis. Utility models. Multi-criteria decision making models: Goal Programming and Analytic Hierarchy Process. Decision Biases. Markov processes and introduction to queuing models. Inventory models and analysis. Computer aided modeling and case studies. 3 lectures, 1 activity.

IME 312. Data Management and System Design. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CSC 232.

Design and management of industrial databases and reporting systems. Relationships of financial accounting databases and production systems. Efficient data entry and reports, queries, macro function, and Internet based database applications. 3 lectures, 1 laboratory.

IME 314. Engineering Economics. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 241.

Economic analysis of engineering decisions. Determining rates of return on investments. Effects of inflation, depreciation and income taxes. Sensitivity, uncertainty, and risk analysis. Application of basic principles and tools of analysis using case studies. 3 lectures.

IME 319. Human Factors Engineering. 3 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202, and junior standing.

Analysis of factors influencing the efficiency of human work. Data on the physical and mental capacities of persons, the physical environment, work organization, and the problem of aging. Design of machines, operations, human computer interface and work environment to match human capacities and limitations, including the handicapped. Multidisciplinary team project. 3 lectures.

IME 320. Human Factors and Technology. 4 units

GE Area F

Term Typically Offered: F

Prerequisite: Junior standing and completion of GE Area B requirements.

Analysis of cognitive, sensory and physical limitations and capabilities of operators and users of technology, both hardware and software, in working and living environments. Analysis of pertinent databases for a proactive approach to designing user-centered industrial products / systems, consumer products, and work environment. 4 lectures. Fulfills GE Area F.

IME 322. Leadership and Project Management. 2 units

Term Typically Offered: TBD

Prerequisite: Junior standing in an engineering program.

Theory and practice in leadership and project management skills for engineering design teams. Basic issues related to, and tools used for, managing projects and concepts comprising project management. Emphasis on situations requiring resolutions and management decisions by groups representing various elements of an enterprise. 2 lectures. Crosslisted as HNRS/IME 322.

IME 326. Engineering Test Design and Analysis. 4 units

Term Typically Offered: F, W, SP

Prerequisite: STAT 321 with a grade of C- or better.

Data gathering and statistical testing applied to industrial engineering and manufacturing fields. Experimental methods for product and process evaluation and comparisons; interpretation of engineering data. Engineering experimental design, linear and nonlinear regression, ANOVA, and multifactor ANOVA. Utilization of existing computer software. 4 lectures.

IME 327. Test Design and Analysis in Manufacturing Engineering. 4 units

Term Typically Offered: F, SP

Prerequisite: STAT 321 with a grade of C- or better or consent of instructor; or ME 236.

Sampling and descriptive statistics. Central limit theorem. Hypothesis testing for means and variances. Analysis of variance (ANOVA) and factorial design. Applications in engineering design, reliability manufacturing, and inspection. Design projects. 3 lectures, 1 laboratory.

IME 330. Fundamentals of Manufacturing Engineering. 4 units

Term Typically Offered: F, W

Prerequisite: IME 141 or ITP 341; IME 142; CE 204; MATE 210; MATE 215; IME 144 or IME 143 and ME 251.

Engineering analysis of manufacturing processes for casting, molding, forming, joining, and machining. Design for manufacturability and estimation of production costs. Process design strategies. Setup and operation of processing equipment; inspection methods. Field trip to manufacturing center. 3 lectures, 1 laboratory.

IME 335. Computer-Aided Manufacturing I. 4 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 244; IME 144 or IME 143 and ME 251; and CSC 101, CSC 231, CSC 232 or CSC 234.

Use of the computer to communicate design information to manufacturing. Computer Numerical Control (CNC) programming. Use of CAD/CAM software. Overview of manufacturing systems in an automated environment, including cellular manufacturing and computer-aided process planning. 3 lectures, 1 laboratory.

IME 336. Computer-Aided Manufacturing II. 4 units

Term Typically Offered: W

Prerequisite: IME 335, ME 212, MATH 244, or consent of instructor.

Advanced Computer Numerical Control (CNC) programming and machine tool control. Machining center operation. Parametric representation of curves and surfaces. Computation of tool paths. Product and process design for CNC machining. CNC machine tool dynamics. Introduction to flexible manufacturing systems and robotics. Design and fabrication projects. 3 lectures, 1 laboratory.

IME 342. Manufacturing Systems Integration. 4 units

Term Typically Offered: W

Prerequisite: MATH 241 and IME 223. Recommended: STAT 321.

Analysis and design tools for production planning, control, and simulation of manufacturing systems. Use of systems modeling software. Overview of ergonomics and facilities design. 3 lectures, 1 laboratory.

IME 351. Advanced Material Removal Process Design. 4 units

Term Typically Offered: TBD

Prerequisite: IME 330.

Advanced turning and milling processes; grinding and non-traditional processes. Thread and gear manufacturing, producibility, machinability, part and tool materials, cutting fluids, and tool life testing. Finishes and measurement of surface roughness. Process design projects. 3 lectures, 1 laboratory.

IME 356. Manufacturing Automation. 4 units

Term Typically Offered: W, SP

Prerequisite: EE 321.

Computers in the factory automation environment. Basic control theory including feedback. Programming and use of programmable logic controllers (PLC), human-machine interface (HMI), and industrial control systems. Interfacing of electro-mechanical systems; analog and digital inputs, output; programmable controllers. Computer process control. 3 lectures, 1 laboratory.

IME 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limit to 4 units.

IME 401. Sales Engineering. 2 units

Term Typically Offered: F, SP

Prerequisite: Senior standing in engineering.

Concepts and principles of engineering in sales. Role of the professional engineer in the analysis, design, development, production, and final application of a product or system required by the buyer. 2 seminars.

IME 408. Systems Engineering. 3 units

Term Typically Offered: F

Prerequisite: CSC 232.

Systems, subsystems, static, dynamic, closed and open systems. Systems design requirements. Performance measures. Process control modeling and analysis, transform methods, linear systems analysis, digital, adaptive and steady state optimal control. Optimal search strategies. Manufacturing, maintenance, replacement and engineering applications. 3 lectures.

IME 409. Economic Decision Systems. 3 units

Term Typically Offered: TBD

Prerequisite: IME 239, IME 314, and IME 305.

Economic evaluation of information for complex decisions. Analysis of risks and uncertainties. Bayes theory and models. Decision theory, sequential decisions, and value of information applied to financial evaluation and control. Major project justification procedures. 3 lectures.

IME 410. Production Planning and Control Systems. 4 units

Term Typically Offered: F, W, SP

Prerequisite: IME 342 or IME 305.

Building blocks of manufacturing resource planning (MRP II). Demand forecasting, production planning, master scheduling development. BOM and inventory files. MRP computations and operational challenges. Capacity analysis and production control in push and pull systems. Enterprise Resource Planning (ERP). Principles of JIT and lean manufacturing. Not open to students with credit in IME 580. 3 lectures, 1 laboratory.

IME 416. Automation of Industrial Systems. 3 units

Term Typically Offered: F

Prerequisite: IME 356, ME 305 or equivalent.

Automation in manufacturing and warehousing. Economic selection of automation systems. Projects in automation. 2 lectures, 1 laboratory.

IME 417. Supply Chain and Logistics Management. 4 units

Term Typically Offered: F, W, SP

Prerequisite: IME 342 or IME 410.

Overview of key logistics and supply chain management concepts. Models and solution methods for the design, control, operation, and management of supply chains. Techniques that are used to analyze supply chains. Team projects in partnership with industry sponsors. 4 lectures.

IME 418. Product-Process Design. 4 units

Term Typically Offered: W

Prerequisite: Senior standing in engineering or graduate standing.

Recommended: IME 450.

Innovative new product design and creative development process. Design for manufacturability. Study of constraints for prototyping, designing, testing, processing, quality, and customer satisfaction. Life-cycle analysis. Examination of relevant environmental and ethical issues. Design projects using real world problems. 3 lectures, 1 laboratory.

IME 420. Simulation. 4 units

Term Typically Offered: F, W, SP

Prerequisite: IME 305; IME 326 or IME 327; or graduate standing.

Queueing systems. Design and analysis of production and service systems using the simulation technique. System modeling. Random number and function generators, programming, and characteristics of simulation languages. Design projects using real world problems. 3 lectures, 1 laboratory.

IME 421. Manufacturing Organizations. 3 units

Term Typically Offered: F

Prerequisite: KINE 250, PSY 201, or PSY 202; junior standing.

Recommended: IME 314.

Theory and principles for manufacturing organizations. Competitive advantage. Strategic planning and operations management for organizations and teams in a rapidly changing environment. Engineering management concepts and practices. Team-based projects and cases. 3 seminars.

IME 424. Industrial Engineering in Healthcare. 4 units

Term Typically Offered: W

Prerequisite: IME 223.

Industrial engineering applications in healthcare industry. Background on healthcare reform. Simulation, operations research, supply chain, facility engineering, process improvement case studies. Emerging topics in industrial engineers in healthcare, change management, patient flow, Lean Six Sigma, nursing, patient safety, and decision-making. 4 lectures.

IME 428. Engineering Metrology. 4 units

Term Typically Offered: F

Prerequisite: IME 143 or IME 144; and IME 326, IME 327, IME 503 or STAT 312.

Measurement of attributes and variables; standards, accuracy and precision; mechanical, electronic and optical/laser measurement systems. Contact and non-contact measurement; straightness, flatness and squareness; GDT (Geometric Dimensioning and Tolerancing); CMM (Coordinate Measurement Machines); surface roughness; metrology for electronic products. 3 lectures, 1 laboratory.

IME 429. Ergonomics Laboratory. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: IME 319; and IME 326 or IME 327.

Investigation of various physiological, sensory, and cognitive capabilities and limitations of people in work and living environments through laboratory data collection, design of experiments and statistical analysis. 1 laboratory.

IME 430. Quality Engineering. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: IME 326, IME 327, IME 503, STAT 302 or STAT 312.

Quality history and philosophies. Cost of quality. Quality control tools. Statistical control charts for variables and attributes. Process capability. Measurement system analysis. Acceptance sampling. Reliability and life testing methods. Quality improvement tools: Quality Function Deployment, Failure Modes and Effects Analysis, Six Sigma, quality standards and systems. 4 lectures.

IME 432. Additive Manufacturing. 4 units

Term Typically Offered: W

Prerequisite: IME 144 or ME 251; and MATE 210. Recommended: IME 330.

Engineering principles, materials, equipment, design for manufacturing, process flow, post processing, and applications of additive manufacturing processes, including: photopolymerization, powder bed fusion, extrusion, direct energy deposition, printing, binder jetting, and sheet lamination. Process selection, environment considerations, safety, and cost analysis for manufacturing. 3 lectures, 1 laboratory.

IME 435. Reliability for Design and Testing. 3 units

Term Typically Offered: TBD

Prerequisite: IME 326, IME 327, IME 503 or STAT 312.

Reliability concepts and mathematical models, mechanical device reliability, electrical device reliability, systems reliability and maintainability, reliability data, assurance program elements. Not open to students with credit in IME 542. Course may be offered in classroom-based or online format. 3 lectures.

IME 441. Engineering Supervision I. 1 unit

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Theory and principles of supervision. Application of fundamental concepts and techniques of supervision provided by assignment in engineering laboratories. 1 laboratory each.

IME 442. Engineering Supervision II. 1 unit

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Theory and principles of supervision. Application of fundamental concepts and techniques of supervision provided by assignment in engineering laboratories. 1 laboratory each.

IME 443. Facilities Planning and Design. 4 units

Term Typically Offered: F, W, SP

Prerequisite: IME 144; IME 223; IME 314; and either IME 305 or IME 342. Recommended: IME 319 and IME 420.

Design concepts and input requirements in planning and design of new or renovation of existing manufacturing systems. Product, process, and flow and activity analysis techniques. Flow lines and buffering techniques. Computer-aided layout design and evaluation. Design of handling systems. Math models of location problems. Multidisciplinary team project. 3 lectures, 1 laboratory.

IME 450. Manufacturing Process and Tool Engineering. 4 units

Term Typically Offered: SP

Prerequisite: MATH 244, IME 330. Recommended: IME 335.

Engineering design of fixtures and tools for manufacturing processes. Interpretation of engineering design specifications. Analysis of cost, quality, productivity, and safety in tool design. Mechanical analysis of tool design. Detailed process design for net shape production and component design for manufacture. Process and tool design projects. 3 lectures, 1 laboratory.

IME 451. Radio Frequency Identification System Design. 4 units

Term Typically Offered: W

Prerequisite: EE 201 or IME 156 or ITP 150.

Radio frequency identification (RFID) and its role in asset and inventory management, facility access, payment transaction systems, and other applications. Physics and types of RFID. Economic analysis. Multidisciplinary project teams design RFID systems for real-world applications. 2 lectures, 2 laboratories.

IME 457. Advanced Electronic Manufacturing. 4 units

Term Typically Offered: TBD

Prerequisite: EE 201, IME 156 or IME 157.

Design and fabrication of commercial electronic products; PCB layout design, bill of material analysis and component purchasing, production planning and scheduling, programming automated surface-mount assembly line, marketing of products. Multidisciplinary project teams exposed to real-world challenges of electronics manufacturers. 2 lectures, 2 laboratories.

IME 458. Microelectronics and Electronics Packaging. 4 units

Term Typically Offered: SP

Prerequisite: EE 112 or EE 201. Recommended: MATE 210.

Materials, processes, and reliability of microelectronics and electronics packaging, surface mount assembly and printed circuit board fabrication. Organic substrates and ceramic substrates. Mechanical design, thermal, and electrical considerations in electronic packaging. Design for manufacturability. Overview of optoelectronics packaging and other emerging technologies in microelectronics and electronic packaging. Project on design and manufacture of an electronic device. 3 lectures, 1 laboratory. Crosslisted as CPE 488/IME 458/MATE 458.

IME 460. Introduction to Value Chain Analysis. 3 units

Term Typically Offered: SP

Prerequisite: IME 223 or ITP 303; and senior standing.

Introduction to value chain concepts and their application to the analysis and improvement of business operations. Application of lean principles to optimize the value chain. 3 lectures.

IME 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 lectures.

IME 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

IME 481. Senior Design Project I. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing in major and consent of instructor.

Culminating design project typical of problems faced in professional practice. Individual or group projects typically involve system design, modeling, analysis and testing. Project method includes costs, planning, scheduling, appropriate research methodology and formal reports. Professional ethics. 1 lecture, 1 laboratory.

IME 482. Senior Design Project II. 3 units

Term Typically Offered: F, W, SP

Prerequisite: IME 481.

Continuation of IME 481. Involves research methodology: problem statement, method, results, analysis, synthesis, project design, construction (when feasible), and evaluation/conclusions. Project results presented in thesis-like formal reports suitable for reference library and formal oral presentations. Professional ethics. 1 lecture, 2 laboratories.

IME 495. Cooperative Education Experience. 4-12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

IME 500. Individual Study. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair and supervising faculty member.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to students who have demonstrated ability to do independent work.

IME 503. Applied Statistical Methods in Engineering. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing.

Application of important statistical distributions in engineering and management. Coverage of sampling distributions and their roles in design of experiments. Applications of hypothesis testing, ANOVA, analysis of covariance, multiple and nonlinear regressions in industry and service systems. Introduction to nonparametric analysis. 3 lectures, 1 laboratory.

IME 507. Graduate Seminar. 2 units

Term Typically Offered: F

Prerequisite: Graduate standing.

Seminars in industrial engineering, integrated technology management, and engineering management by researchers and practitioners from academia and industry. Preparation for conducting research. Presentation of student research projects. Overview of graduate education requirements. Ethics issues in research. 1 seminar, 1 laboratory.

IME 510. Systems Engineering I. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing or consent of instructor.

Project management. Scheduling and budgeting. Queuing theory. Process control and life-cycle cost analysis. Contracts and negotiation. 4 lectures. Crosslisted as AERO/IME 510.

IME 511. Systems Engineering II. 4 units

Term Typically Offered: TBD

Prerequisite: AERO 510 or IME 510, graduate standing or consent of instructor.

Risk management. Design strategies to meet system/mission requirements. Design for supportability, manufacturability, reliability, etc. Quality function development and quality control concepts. 4 lectures. Crosslisted as AERO/IME 511.

IME 520. Advanced Information Systems for Operations. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor. Recommended: IME 410.

Advanced information systems (IS) applications in manufacturing and service operations. Introduction of common IS applications, such as manufacturing execution systems; reporting systems; capacity planning systems; scheduling systems; and customer inquiry systems. Industry-specific analysis of IS requirements and availability. 4 seminars.

IME 527. Design of Experiments. 4 units

Term Typically Offered: W

Prerequisite: IME 326 or IME 327 or IME 503 or STAT 312.

Experimental design principles. Comparative experiments for population parameters. ANOVA and randomized block design. Factorial designs, the 2^k factorial designs, and factorial designs with blocks. Fractional factorial designs. Response surface methodology. Fitting regression models. Design projects using real world problems. Substantial use of statistical software. 3 lectures, 1 laboratory. Formerly IME 427.

IME 541. Advanced Operations Research. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing and consent of instructor.

Operations Research approach to model building. Linear programming and sensitivity analysis. Network flow models. Integer programming, large scale linear programming. Goal programming and multi-attribute decision making. Dynamic programming. Nonlinear programming and search methods. Applications in model building and computer solutions in planning, resource allocation, scheduling, and other industrial and service operations. 3 lectures, 1 laboratory.

IME 542. Applied Reliability Engineering. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing. Recommended: IME 326 or IME 327 or IME 503 or STAT 312.

Reliability terminology and bathtub curve. Failure distributions: Exponential, Lognormal, and Weibull. Probability plotting. Reliability of systems. Maintainability and availability. Reliability in design; Load-strength analysis; Failure modes and effects analysis; Fault tree analysis. Reliability testing; Reliability management. Not open to students with credit in IME 435. 3 lectures, 1 laboratory.

IME 543. Applied Human Factors. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing or consent of instructor. Recommended: IME 326 or IME 327 or IME 503.

Human factors/ergonomics analysis and evaluation of automation, mobile communication technology, and interface design for Internet websites. Usability analysis of current hardware/software products with an emphasis on a user-centric design approach. Team-based projects. 3 seminars, 1 laboratory.

IME 544. Advanced Topics in Engineering Economy. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing. Recommended: Undergraduate course in engineering economy.

Review of interest calculations and comparison of economic alternatives. Replacement analysis. Capital planning and budgeting. Mathematical programming and capital budgeting. Utility theory. Decision making under risk and uncertainty. Application of simulation in risk modeling. Benefit-cost analysis. Multi-attribute decision making. Analytic hierarchy process. 3 lectures, 1 activity.

IME 545. Advanced Topics in Simulation. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing. Recommended: IME 420.

Validation of simulation models. Statistical techniques for variance reduction. Experimental design and optimization. Comparison of attributes of simulation languages. Review of current manufacturing and service industry applications. Case studies. 3 lectures, 1 laboratory.

IME 556. Technological Project Management. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor.

Projects in industrial organizations and enterprises. Emerging technologies and project management. Relationship to strategic plans and managing change in organizations. Formulating, selecting, structuring, and planning projects. Project organization and control. Overcoming barriers. Application of project management software. 3 seminars, 1 laboratory.

IME 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors. Topic lists will be provided with class schedule outlines. 1-4 seminars.

IME 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

IME 577. Engineering Entrepreneurship. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

The special requirements of entrepreneurship in a high-tech environment. Guest lectures, focused seminar topics, a business plan project, and case studies provide the tools to evaluate and pursue technology-based business opportunities. 4 lectures.

IME 580. Manufacturing Systems. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing.

Modern approaches in production and inventory planning and control to support large-scale manufacturing systems, material requirements planning (MRP I), manufacturing resource planning (MRP II), and just-in-time (JIT) manufacturing systems. Enterprise resource planning (ERP) and integration with financials. Information requirements, operational issues, and policy matters. Not open if credit in IME 410. 4 seminars.

IME 596. Graduate Project/Internship. 1-5 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Integrative learning experience through internship and project. Focus on a significant industrial or research problem in an engineering field. Project involves student(s), faculty, and sponsoring representative(s) in a collaborative learning environment, and culminates in a comprehensive written report. Total credit limited to 5 units.

IME 599. Thesis. 1-9 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Systematic study of a significant problem under faculty supervision. Both a written thesis and an oral defense are required. Total credit limited to 9 units.

Interdisciplinary Studies in Liberal Arts (ISLA)

ISLA Courses

ISLA 123. Introduction to Science, Technology & Society. 4 units

Term Typically Offered: F, W, SP

Introductory exploration of science, technology, and society relationships from interdisciplinary perspectives in the arts, communications, humanities, and social sciences. Topic areas include ethics and public policy; gender, race and culture; media arts and society; science and risk communication. 4 lectures.

ISLA 201. Introduction to Interdisciplinary Studies. 4 units

Term Typically Offered: F, SP

Prerequisite: ES 112, ISLA 123, RELS 201, or WGS 201.

Focus on methods, concepts and skills in the Interdisciplinary Studies major, and on career and graduate school opportunities. Refinement of individualized plan of study to reflect professional, educational, and personal goals. 4 lectures.

ISLA 240. Introduction to Media Arts and Technologies. 4 units

Term Typically Offered: F, SP

Prerequisite: Completion of GE C3. Recommended: TH 210.

The intimate connection between the desire for artistic expression and current technologies that can assist that expression. Examination of technologies for theater, sound, cinema, gaming, and embodied media. Guest speakers with expertise. 4 lectures.

ISLA 303. Values and Technology. 4 units

GE Area C4

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course from GE Area C.

Humanistic investigation into the theoretical and practical applications of technology with specific reference to the social effects of technological change. For all majors. Non-technical. 4 lectures. Crosslisted as HNRS 304/ISLA 303. Fulfills GE C4.

ISLA 305. Topics in Public Engagements with STEM. 4 units

GE Area F

Term Typically Offered: W

Prerequisite: Junior standing and completion of GE Area B.

Recommended: ISLA 123.

Exploration of contemporary issues in science, technology, engineering, and mathematics (STEM), with an emphasis on public understandings of and engagements with STEM research and teaching cultures. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Fulfills GE Area F.

ISLA 315. Critical Issues in Latin American Studies. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course in lower division GE Area D. Recommended: GE Area D2 or D3.

An interdisciplinary approach to selected topics and issues that address how social, economic, political, and cultural forces have shaped the challenges that face contemporary Latin America. Descriptive subtitles assigned to each course. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Fulfills GE D5.

ISLA 316. London: From Roman Colony to World Capital. 4 units

GE Area D5

Term Typically Offered: SU

Prerequisite: Junior standing; enrollment in London Study; completion of GE Area A with a grade of C- or better; completion of one course in GE Area D. Corequisite: Enrollment in ISLA 319.

Selective examination of the historical and cultural legacy of London within the development of Western civilization as well as its influence on the submission and eventual emergence of the non-Western world in the twentieth century. An analytical and interpretive study of how London shaped the social, economic, political and legal institutions of Western society. 4 lectures. Fulfills GE D5.

ISLA 319. London Activities. 2 units

CR/NC

Term Typically Offered: SU

Prerequisite: Enrollment in London Study program.

Analytical and interpretive survey of the principal center of the English speaking world. The development of London from Roman administrative capital to modern cultural, financial and political colossus. Credit/No Credit grading only. 2 activities.

ISLA 320. Topics and Issues in Values, Media and Culture. 4 units

GE Area C4

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of one of the following: GE Area C1, C2 or C3. Recommended: Completion of GE Area C1 or C3.

The interplay of values, media, and culture from an interdisciplinary perspective. Descriptive subtitles assigned to each course. The Schedule of Classes will list topic selected. 4 lectures. Total credit limited to 8 units with different subtopic; repeatable in same term. Crosslisted as HNRS/ISLA 320. Fulfills GE C4.

ISLA 330. Cal Poly Land: Nature, Technology, and Society. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area B.

Scientific investigation of the natural features of the Cal Poly landscape and their transformations by land management technology. Analysis of the environmental, economic, social, and political effects of agriculture, resource extraction, and construction technology on that landscape. Emphasis on the educational, land-use, and long term planning issues of technology presented by this case study. 4 lectures. Crosslisted as AG/ISLA/UNIV 330. Fulfills GE Area F.

ISLA 340. Media Arts and Technologies: Storytelling. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ISLA 240 or the completion of an ART or TH course in GE Area C3.

Creation of expressive technology-based pre-production works for standard television and film presentation to interactive technological environments. Pre-production script work, storyboarding, flow chart design, collaborative story creation, audience testing, and basic animatic construction. Visiting professionals work with students directly in collaborative workshops. 3 lectures, 1 activity.

ISLA 341. Media Arts and Technologies: Cinematic Process. 4 units

Term Typically Offered: W, SP

Prerequisite: ISLA 340.

Cinematic production including adapting a narrative for different presentation formats, storyboarding, lighting, sound recording, cinematography and editing. Production of short works designed as foundational pieces that can be built upon individually or in teams in independent study. Visiting professionals run collaborative production workshops. 2 lectures, 2 activities.

ISLA 350. The Global Environment. 4 units

GE Area F

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area B.

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 4 lectures. Crosslisted as AG/EDES/ENGR/GEOG/ISLA/SCM/UNIV 350. Fulfills GE Area F.

ISLA 355. Interdisciplinary Research Methods. 4 units

Term Typically Offered: W, SP

Prerequisite: ISLA 201. Recommended: STAT 130, STAT 217, STAT 218, or STAT 251.

Exploration of interdisciplinary research strategies, theory, and process, including contextualization, perspective taking, and integration. Development of knowledge and skills needed to conduct original interdisciplinary research. Preparation for senior project or senior portfolio. 4 lectures.

ISLA 393. Action-oriented Ethnography. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; completion of GE Area D3; and one of the following: ANT 201, ANT 202, ANT 250, ISLA 123, any ES course, or any WGS course.

Development of knowledge and skills needed to conduct original action-oriented ethnographic research. Grounded in the reflexive 'turn' in anthropology and critical race, science, technology and society, queer and feminist studies, students will engage questions of authority, representation, critical consciousness and justice. 4 lectures. Crosslisted as ANT/ISLA 393.

ISLA 400. Independent Study Project. 1-4 units

Term Typically Offered: TBD

Prerequisite: Junior or senior standing and consent of instructor.

Independent study project focusing more than one discipline on a problem of study related to the liberal arts. May involve travel and/or independent research. Bibliography and study plan submitted in advance. Total credit limited to 8 units.

ISLA 440. Advanced Interdisciplinary Studies Seminar. 4 units

Term Typically Offered: F, SP

Prerequisite: ISLA 201. Recommended: ISLA 355.

Advanced examination of selected interdisciplinary topic. Topics will be examined from perspective of multiple disciplines. The Class Schedule will list topic selected. Total credit limited to 8 units. 4 lectures.

ISLA 450. Summer Internship in London. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Junior standing and consent of the Director of London Study.

Extensive work experience in London. Administration, orientation, and supervision of independent work by the service provider. Intensive two-week orientation, eight-week full-time work assignment. Evaluation by instructor, internship supervisor, and employer. Credit/No Credit grading only. 4 lectures, 8 units of independent study.

ISLA 456. Advanced Project-Based Learning in Science, Technology & Society. 4 units

Term Typically Offered: W, SP

Prerequisite: ISLA 123; completion of GE area A with a grade of C- or better; completion of GE Area B2 or B3; Junior standing; minor in one of the following: Ethics, Public Policy, Science and Technology; Gender, Race, Culture, Science, and Technology; Media Arts, Society and Technology; or Science and Risk Communication.

Develop, maintain and lead teams in a project investigating complex multi-disciplinary issues in science, technology and society. Integrate knowledge across the minors. 2 lectures, 2 activities.

ISLA 461. Senior Project. 4 units

Term Typically Offered: W, SP

Prerequisite: Senior standing; and ISLA 355.

Selection and completion of an interdisciplinary research or creative project that draws upon at least two disciplines. 4 seminars.

ISLA 470. Selected Advanced Topics. 2-4 units

Term Typically Offered: TBD

Prerequisite: Junior standing; and completion of GE Area A with a grade of C- or better.

Focused interdisciplinary study of an issue impacting or impacted by the liberal arts, combining the insight and expertise of more than one of the liberal arts disciplines, especially as they interface with the sciences and technology and/or international studies in a study abroad setting. The Schedule of Classes will list topic selected. Total credit limited to 8 units; repeatable in same term. 2-4 lectures.

Italian (ITAL)

ITAL Courses

ITAL 101. Elementary Italian I. 4 units

Term Typically Offered: F

Beginning Italian. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and conversation. Language taught in its intercultural context. 3 lectures, 1 activity.

ITAL 102. Elementary Italian II. 4 units

Term Typically Offered: W

Prerequisite: ITAL 101 or consent of instructor.

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and conversation. Language taught in its intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

ITAL 103. Elementary Italian III. 4 units

Term Typically Offered: SP

Prerequisite: ITAL 102 or consent of instructor.

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and conversation. Language taught in its intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity.

ITAL 201. Intermediate Italian I. 4 units

GE Area C5

Term Typically Offered: F

Prerequisite: ITAL 103 or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in Italian within an intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Fulfills GE C5.

Japanese (JPNS)

JPNS Courses

JPNS 101. Elementary Japanese I. 4 units

Term Typically Offered: F

Beginning Japanese. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, basic conversation, and introduction to Japanese culture. 3 lectures, 1 activity.

JPNS 102. Elementary Japanese II. 4 units

Term Typically Offered: W

Prerequisite: JPNS 101 or consent of instructor.

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, basic conversation, and introduction to Japanese culture. To be taken in numerical sequence. 3 lectures, 1 activity.

JPNS 103. Elementary Japanese III. 4 units

Term Typically Offered: SP

Prerequisite: JPNS 102 or consent of instructor.

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, basic conversation, and introduction to Japanese culture. To be taken in numerical sequence. 3 lectures, 1 activity.

JPNS 201. Intermediate Japanese I. 4 units

GE Area C5

Term Typically Offered: F

Prerequisite: JPNS 103 or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in Japanese within an intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Fulfills GE C5.

Journalism (JOUR)

JOUR Courses

JOUR 102. Introduction to Journalism. 1 unit

Term Typically Offered: F

Introduction to current practices in American news media with a focus on emerging technologies and traditional print and broadcast operations. Exploration of changing career opportunities in news and public relations. Overview of student media organizations and requirements for academic success in journalism. 1 lecture.

JOUR 201. Journalism History. 4 units

Term Typically Offered: SP

Survey of historical influences in the development of today's journalism. Contributions of women and minorities to American mass media. Rise of technology in the communication industry. 4 lectures.

JOUR 203. News Reporting and Writing. 4 units

Term Typically Offered: F, W, SP

Introduction to the fundamental techniques of reporting and writing news articles from print and online perspectives. Extensive laboratory and field practices in gathering and evaluating information. Writing basic news stories under close supervision. 3 lectures, 1 laboratory.

JOUR 205. Agricultural Communications. 4 units

Term Typically Offered: F, W, SP

Survey of the media of agricultural communication. Newspaper farm pages and sections, general and specialized agricultural magazines. Radio and TV farm broadcasts. Digital media sources. Public and private agencies involved in agricultural communication. Role of California minorities in agriculture. Writing on agriculture-related issues. 3 lectures, 1 activity.

JOUR 218. Media, Self and Society. 4 units

GE Area D4

Term Typically Offered: W, SP

Overview of the interaction between mass media and individuals in American society. Drawing on theoretical perspectives from mass communication and psychology to explore how individuals develop a coherent understanding of self within a highly mediated world. The power and influence of media messages and practices. Individual responsibility in an information society. 4 lectures. Crosslisted as COMS/JOUR 218. Fulfills GE D4.

JOUR 219. Multicultural Society and the Mass Media. 4 units

USCP

Term Typically Offered: F, W, SP

The role of the mass media in a democratic multicultural society. Portrayal and stereotyping of ethnic minorities by different mass media forms throughout U.S. history. The growing impact of minorities in the United States. Achievement and goals of current American ethnic media, with special attention to Latinos/as and African-Americans. 4 lectures. Fulfills USCP.

JOUR 220. Introduction to Radio Broadcasting. 2 units

Term Typically Offered: W

Prerequisite: Acceptance as a KCPR staff member and consent of instructor.

Development of skills and knowledge to produce live and recorded radio shows for the campus radio station KCPR-FM. Basic station operations, FCC compliance standards, and basic station management. Required for KCPR staff. 2 lectures.

JOUR 270. Selected Topics. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

JOUR 285. Introduction to Multimedia Journalism. 4 units

Term Typically Offered: F, W, SP

Prerequisite: JOUR 203.

Introduction to the social, editorial and technical issues surrounding the web as a form of communication. Fundamentals of gathering, writing and publishing content for the web that includes using photographs, sound, pictures and video to tell a story. 3 lectures, 1 laboratory.

JOUR 302. Mass Media Law. 4 units

Term Typically Offered: F, W, SP

Prerequisite: JOUR 203.

Legal basis for freedom of expression. Court decisions resolving conflicts between First Amendment and right to fair trial, privacy, reputation. Source confidentiality, freedom of information, contempt, copyright. Federal and state laws and regulations affecting mass media reporters, editors, publishers, news directors. Course may be offered in classroom based or online format. 4 lectures.

JOUR 303. Web Audio and Video. 4 units

Term Typically Offered: F, W

Prerequisite: JOUR 285.

Concepts and technologies associated with bringing video, still images and audio online. Process of web-based audio and video creation, production and publication, from inception to publishing. 3 lectures, 1 laboratory.

JOUR 304. Public Affairs Reporting. 4 units

Term Typically Offered: F

Prerequisite: JOUR 203.

Experience leading to advanced skills in reporting and writing stories about contemporary issues, government and courts. Field and laboratory assignments in beat reporting, public meeting coverage, writing style, investigative techniques, and online journalism research. 3 lectures, 1 laboratory.

JOUR 312. Public Relations. 4 units

Term Typically Offered: F, W

Prerequisite: Sophomore standing.

Overview of the history, growth and ongoing development of public relations as an information management function in a multicultural environment. Public relations practices used in commercial and non-profit sectors, and firsthand application of public relations skills. 4 lectures.

JOUR 320. Cal Poly Radio Laboratory. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: JOUR 220 and consent of instructor.

Field experience in radio station operations at KCPR-FM, the campus radio station. Emphasizes support functions such as recording announcements, planning and carrying out promotions, underwriting, events and other station management duties. Required of students also hosting live or prerecorded on-air programs. Total credit limited to 8 units. Open only to students on staff at KCPR-FM. 1 laboratory.

JOUR 331. Contemporary Advertising. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A3 with a grade of C- or better.

Principles of advertising, copy, layout, and production across media platforms, including online, mobile, social, print and broadcast. Economic, political, and social function of advertising in a free market society. Advertising ethics. Social responsibility of advertising in a multicultural environment. Emerging advertising technologies. 4 lectures.

JOUR 333. Broadcast News. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A3 with a grade of C- or better.

Beginning broadcast news writing and reporting for radio and television. Emphasis on developing news judgment and producing radio newscasts. Introduction to television studio equipment and procedures. Lab experience includes writing and reporting live on-air for KCPR. Course may be offered in classroom-based or online format. 3 lectures, 1 laboratory.

JOUR 334. Editing. 4 units

Term Typically Offered: F, W, SP

Prerequisite: JOUR 203. Replaces JOUR 233.

Editing for print and online publication. Using the Associated Press style. Writing headlines, captions, summaries and other display text. Repurposing various media content for the web and other formats. Legal and ethical issues for the editor. 3 lectures, 1 laboratory.

JOUR 342. Public Relations Writing and Editing. 4 units

Term Typically Offered: F, W, SP

Prerequisite: JOUR 312.

Theory, strategic planning and practice in writing persuasive public relations copy for diverse internal and external audiences. Emphasis on gathering information, preparing news releases, newsletters and other communications vehicles. Analysis of various media case studies. 4 lectures.

JOUR 346. Broadcast Announcing and Production. 4 units

Term Typically Offered: W

Prerequisite: JOUR 203. Recommended: JOUR 285.

Develop on-air skills in the performance of voice-overs, stand-ups, hosting and the production of televised public service announcements. Emphasis on the effective use of audio and non-linear video editing techniques as well as broadcast writing. 3 lectures, 1 laboratory.

JOUR 348. Electronic News Gathering. 4 units

Term Typically Offered: SP

Prerequisite: JOUR 203 and JOUR 333.

Instruction on electronic news gathering (ENG) that includes advanced news writing, field reporting and editing for broadcast. Emphasis on developing research techniques, interviewing skills, responsible and effective non-linear video editing, compelling use of natural sound and professional on-air delivery. 3 lectures, 1 laboratory.

JOUR 350. Data Journalism. 4 units

Term Typically Offered: SP

Prerequisite: JOUR 285; and one of the following: STAT 130, STAT 217, STAT 218, or STAT 251.

Introduction to the techniques of finding stories in data sets and presenting them visually via interactive online displays. Emphasis on adapting emerging tools for digital storytelling. 3 lectures, 1 laboratory.

JOUR 352. Advanced Newspaper Reporting Practicum. 4 units

Term Typically Offered: F, W, SP

Prerequisite: JOUR 304 or JOUR 334 (formerly JOUR 233).

Reporting lab for the print and digital editions of Mustang News. Total credit limited to 8 units. 3 lectures, 1 laboratory.

JOUR 353. Advanced Broadcast Journalism Practicum. 4 units

Term Typically Offered: F, W, SP

Prerequisite: JOUR 333, JOUR 346, or JOUR 348.

Students produce a live 30-minute CPTV newscast per week, or a one-hour KCPR segment that incorporates news, information, talk and entertainment. Emphasis on news producing, reporting and announcing skills. Total credit limited to 8 units. 3 lectures, 1 laboratory.

JOUR 378. Advanced Sportscasting. 4 units

Term Typically Offered: SP

Prerequisite: JOUR 285 and JOUR 303 or JOUR 346.

Develop advanced skills in sports reporting and writing for broadcast, web and social media. Play-by-play. Job search in sports journalism. Field trip may be required. Course offered in hybrid format with classroom-based and online learning. 3 lectures, 1 laboratory.

JOUR 385. Media Innovation and Entrepreneurship. 4 units

Term Typically Offered: W

Prerequisite: Sophomore standing. Recommended: BUS 310 or COMS/JOUR 218.

Innovation and entrepreneurship in journalism. Human-centered design. Business plan development. Designing content to reach and engage an audience. Identifying opportunities to create sustainable journalistic enterprises for real-world application in Cal Poly's student-run media organizations. 4 lectures.

JOUR 390. Visual Communication for the Mass Media. 4 units

Term Typically Offered: F, W, SP

Prerequisite: JOUR 203.

Theory and application of visual communication in today's media. Visual communication's power to inform, educate and persuade. Production of visual media across digital, broadcast and print platforms. 3 lectures, 1 laboratory.

JOUR 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

JOUR 401. Global Communication. 4 units

Term Typically Offered: SP

Prerequisite: JOUR 203 and junior standing.

Global communications facilities and operations; world transmission of information; survey of world wire services and international print and electronic media. Analysis of press operations under varying government ideologies, including third world countries. 4 seminars.

JOUR 402. Journalism Ethics. 4 units

Term Typically Offered: F, W, SP

Prerequisite: JOUR 203.

Current issues revolving around the social responsibility of the mass media. Role of the public, government, and media in considerations of media accountability. Professional behavior in media organizations. 4 seminars.

JOUR 403. Multimedia Production for Public Relations and Advertising. 4 units

Term Typically Offered: F, W

Prerequisite: JOUR 303 or JOUR 348.

Development of fundamentals pertaining to the technical and aesthetic proficiencies used in video communication for public service, public relations, marketing and advertising. All aspects of pitching, planning, production, editing and post-production in addition to historical and regulatory aspects of communication policy and mandates. 3 lectures, 1 laboratory.

JOUR 407. Feature Writing. 4 units

Term Typically Offered: W

Prerequisite: JOUR 203.

Practice in researching, interviewing and the writing and marketing of both long and short form nonfiction articles for various media outlets. Analysis of similar work in current distribution. 4 lectures.

JOUR 410. Advanced Digital Journalism. 4 units

Term Typically Offered: F, W, SP

Prerequisite: JOUR 285.

Apply the theories and applications of digital journalism to the development and publication of innovative digital content. 3 lectures, 1 laboratory.

JOUR 412. Public Relations and Crisis Management. 4 units

Term Typically Offered: F

Prerequisite: Junior standing.

Apply contemporary public relations theory to turn crisis into opportunity. Analyze Homeland Security and FEMA best practices using public relations framework and strategy. Practical exercises in planning, implementing, and evaluating public relations messages in a variety of media platforms. 4 lectures.

JOUR 413. Public Relations Campaigns. 4 units

Term Typically Offered: F, W, SP

Prerequisite: JOUR 312 and JOUR 342.

Development of skills needed to plan and conduct internal and external public relations campaigns for corporate and non-profit organizations. Includes goal setting, management of resources, budgeting, creation of campaign communications, and outcomes analysis. 4 lectures.

JOUR 415. Advanced Public Relations Practice: CCPR. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BUS 453 or JOUR 413.

Proposing, creating, managing, and implementing public relations campaigns for community-based clients on behalf of the student-run firm, Central Coast PRspectives. 3 lectures, 1 laboratory.

JOUR 418. Copyright, Trademark, Patent and Commercial Speech in Digital Media. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing; and completion of GE Area A with a grade of C- or better.

Examination of intellectual property rights covered by copyright, trademark and, to a limited degree, patent law as well as commercial speech rights in a digital media age. Emphasis on intellectual property rights as they affect content creators and other publishers in a digital world. 4 lectures.

JOUR 444. Media Internship. 3 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: JOUR 352, JOUR 353, or JOUR 413; and internship coordinator approval.

Application of techniques on daily basis with media under supervision of department faculty. Credit/No Credit grading only.

JOUR 460. Senior Project. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor; Journalism majors only.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 90 hours total time.

JOUR 462. Senior Media Practicum. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing.

Capstone experience that applies principles and tools of print, broadcast and digital journalism and public relations to tell engaging stories across multiple platforms. Emphasis on integrating text, video, audio, graphics, search engine optimization and social networking to produce content for digital publication. 3 lectures, 1 laboratory.

JOUR 470. Selected Advanced Topics. 2-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor; junior standing.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 2-4 lectures.

JOUR 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

Kinesiology (KINE)

KINE Courses

KINE 100. Physical Activity for Students with Disabilities. 1 unit

CR/NC

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Basic instruction in the development of skill, knowledge of rules, background and analysis of techniques, and desirable attitudes toward physical fitness and participation in physical activities. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 108. Basketball. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Basic instruction in skill development, knowledge, and desirable attitudes toward physical activity. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 109. Bowling. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Basic instruction in skill development, knowledge, and desirable attitudes toward physical activity. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 112. Intermediate Bowling. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: KINE 109.

Basic instruction and the development of skill, knowledge of rules, background and analysis of techniques, and desirable attitudes toward physical fitness and participation in physical activities. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses nor more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 121. Golf. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Basic instruction in skill development, knowledge, and desirable attitudes toward physical activity. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 122. Golf, Int.-Adv.. 1 unit

CR/NC

Term Typically Offered: F, SP

Prerequisite: KINE 121.

Basic instruction and the development of skill, knowledge of rules, background and analysis of techniques, and desirable attitudes toward physical fitness and participation in physical activities. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses nor more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 125. Jogging. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Basic instruction in skill development, knowledge, and desirable attitudes toward physical activity. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 129. Yoga/Pilates. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Practice of yoga/pilates to improve fitness, flexibility, core strength and endurance. Safe and effective training techniques are emphasized. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 131. Group Fitness Cardio/Strength. 1 unit

CR/NC

Term Typically Offered: W, SP

Group fitness activities designed to improve all components of fitness. Concepts of aerobic endurance, muscular strength and agility are discussed to assist in the formulation of individual goals. Safe and effective training techniques are emphasized. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 132. Beginning Racquetball. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Basic instruction in skill development, knowledge, and desirable attitudes toward physical activity. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 133. Racquetball, Int. - Adv.. 1 unit

CR/NC

Term Typically Offered: TBD

Prerequisite: KINE 132.

Basic instruction and the development of skill, knowledge of rules, background and analysis of techniques, and desirable attitudes toward physical fitness and participation in physical activities. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses nor more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 137. Self-Defense. 1 unit

CR/NC

Term Typically Offered: TBD

Basic instruction in skill development, knowledge, and desirable attitudes toward physical activity. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 138. Karate. 1 unit

CR/NC

Term Typically Offered: TBD

Basic instruction and the development of skill, knowledge of rules, background and analysis of techniques, and desirable attitudes toward physical fitness and participation in physical activities. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses nor more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 3 units. Credit/No Credit grading only. 1 laboratory.

KINE 139. Soccer. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Basic instruction in skill development, knowledge, and desirable attitudes toward physical activity. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 143. Swimming for Non-Swimmers. 1 unit

CR/NC

Term Typically Offered: TBD

Introduction to aquatic environments for adults for the pursuit of swimming and other aquatic exercise. Developing positive attitudes, good swimming habits and safe practices in and around the water. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 144. Beginning Swimming. 1 unit

CR/NC

Term Typically Offered: TBD

Development of swimming strokes for adults to improve confidence and endurance as novice swimmers. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 145. Intermediate Swimming. 1 unit

CR/NC

Term Typically Offered: TBD

Continuation of stroke refinement for adult swimmers who have basic beginning level swimming skills. Practice of swimming strokes and swimming drills for the enhancement of confidence and improvement of swimming effectiveness and endurance. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 147. Advanced Swimming and Conditioning. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Lap swimming for advanced swimmers. Organized structured swim workouts with emphasis on increasing fitness. Participants should have ability to swim three of the four competitive strokes: freestyle, backstroke, breaststroke, butterfly. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 148. Tennis, Beg.. 1 unit

CR/NC

Term Typically Offered: F, SP

Basic instruction in skill development, knowledge, and desirable attitudes toward physical activity. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 149. Tennis, Int. - Adv.. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: KINE 148.

Basic instruction and the development of skill, knowledge of rules, background and analysis of techniques, and desirable attitudes toward physical fitness and participation in physical activities. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses nor more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 151. Volleyball. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Basic instruction in skill development, knowledge, and desirable attitudes toward physical activity. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 154. Weight Training. 1 unit

CR/NC

Term Typically Offered: F, SP

Basic instruction in skill development, knowledge, and desirable attitudes in a weight room setting. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 176. Fitness Walking. 1 unit

CR/NC

Term Typically Offered: F, W

Basic instruction in skill development, knowledge, and desirable attitudes toward physical activity. Enrollment is open to all students. Total limited to 12 units of credit earned in basic instructional KINE courses (KINE 100-176) for non-majors. The following restrictions apply to KINE 100-176: 1) no more than two different activity courses or more than one section of an individual activity course may be taken for credit in any one quarter, 2) a student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course, and 3) any level of an activity course can be repeated only once for credit. Total credit limited to 2 units. Credit/No Credit grading only. 1 activity.

KINE 180. Orientation to Kinesiology. 2 units

CR/NC

Term Typically Offered: F, W

Prerequisite: Kinesiology majors only.

Disciplinary and professional perspectives in Kinesiology and the Kinesiology program at Cal Poly. Credit/No Credit grading only. 2 lectures.

KINE 181. First Aid/CPR/AED. 1 unit

CR/NC

Term Typically Offered: F, W, SP

An American Red Cross certification course in Standard First Aid, CPR, and AED (Automated External Defibrillation). Skills and knowledge necessary in the treatment of life-threatening emergencies, other injuries, and sudden illnesses. Red Cross First Aid/CPR/AED certifications issued upon successful completion of certification requirements. Credit/No Credit grading only. 1 activity.

KINE 208. Golf. 1 unit

Term Typically Offered: TBD

Beginning to intermediate golf skills, rules, and etiquette including a combination of skill instruction and course play. Leadership activity assigned. 1 activity.

KINE 210. Tennis. 1 unit

Term Typically Offered: TBD

Beginning to intermediate tennis skills, etiquette, rules, and equipment. Singles and doubles play. Leadership activity assigned. 1 activity.

KINE 212. Racquetball. 1 unit

Term Typically Offered: TBD

Beginning to intermediate racquetball skills. Rules, regulations, basic strokes and shots, strategies and tournament play. Leadership activity assigned. 1 activity.

KINE 213. Basketball. 1 unit

Term Typically Offered: TBD

Beginning to intermediate basketball skills. Skill development, knowledge of rules, advanced strategies for playing basketball. Leadership activity assigned. 1 activity.

KINE 214. Volleyball. 1 unit

Term Typically Offered: TBD

Beginning to intermediate volleyball skills. Basic fundamentals, rules, regulations, strategies, skill development and games. Leadership activity assigned. 1 activity.

KINE 223. Cross Country and Track Events. 1 unit

Term Typically Offered: TBD

Beginning to intermediate skills in performance and analysis. Knowledge of rules and strategies. Development of skills and knowledge relating to performance, training, and scoring for cross-country and track running events. Leadership activity assigned. 1 activity.

KINE 224. Field Events. 1 unit

Term Typically Offered: TBD

Intermediate skills in performance and analysis. Knowledge of rules and strategies. Development of skills relating to performance, training, and scoring track field events. Leadership activity assigned. 1 activity.

KINE 226. Soccer. 1 unit

Term Typically Offered: TBD

Development of beginning and intermediate skills. Rules, regulations and game play. Leadership activity assigned. 1 activity.

KINE 229. Badminton. 1 unit

Term Typically Offered: TBD

Beginning and intermediate skills. Rules, regulations and strategies for competition. Leadership activity assigned. 1 activity.

KINE 230. Aquatic Fitness Activities. 1 unit

Term Typically Offered: TBD

Aquatic based resistance and cardiovascular activities for individual and group settings. Stroke development also included for front crawl, backstroke, breaststroke, butterfly, elementary backstroke and sidestroke. Must be able to swim 25 yards non-stop in order to participate. Leadership activity assigned. 1 laboratory.

KINE 231. Leading Group Fitness Activities. 2 units

Term Typically Offered: TBD

Prerequisite: KINE 230.

Aerobic fitness activities appropriate for large and small group exercise sessions. Development of instructional competency in the basic components of aerobic exercise, and leadership skills associated with the delivery of these activities. Emphasis on warm-up, cardiovascular fitness, heart-rate monitoring, dance choreography, elements of higher risk stretching and relaxation protocols, and equipment, and muscle conditioning. 2 activities.

KINE 250. Healthy Living. 4 units

GE Area D4

Term Typically Offered: F, W, SP

Personal health with emphasis on healthful behavioral practices including physical fitness, nutrition, psychosocial well-being, alcohol and other drugs, intentional and unintentional injury, reproductive health, infectious and non-infectious diseases. Not open to students with credit in HLTH/KINE 255 or Liberal Studies majors. Course may be offered in classroom-based or online format. 4 lectures. Crosslisted as HLTH/KINE 250. Fulfills GE D4.

KINE 255. Personal Health: A Multicultural Approach. 4 units

GE Area D4; USCP

Term Typically Offered: F, W, SP

Personal health with special emphasis on multicultural practices. Not open to students with credit in HLTH/KINE 250. Course may be offered in classroom-based or online format. 4 lectures. Crosslisted as HLTH/KINE 255. Fulfills GE D4 and USCP.

KINE 260. Women's Health Issues. 4 units

GE Area D4; USCP

Term Typically Offered: F, W, SP

Introduction to major health issues that affect women disproportionately or differently from men. Topics include female sexual health and reproduction, exercise and eating behaviors, substance abuse, mental health and stress, and violence against women. Course may be offered in classroom-based or online format. 4 lectures. Crosslisted as HLTH/KINE 260. Fulfills GE Area D4 and USCP.

KINE 265. Introduction to Community and Public Health. 3 units

Term Typically Offered: W, SP

Prerequisite: HLTH 101 or KINE 180; and one of the following: HLTH/KINE 250; HLTH/KINE 255; or HLTH/KINE 260.

Introduction to community health and the core functions of public health. Social-ecological, behavioral, and policy influences on community and population health. Health promotion in community/public health settings. 3 lectures. Crosslisted as HLTH/KINE 265.

KINE 266. Sport and Exercise Psychology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

Recommended: PSY 201 or PSY 202.

An introduction to the field of sport and exercise psychology. Psychological theories and research related to topics such as motivation to participate in sport and exercise, exercise and psychological well-being, teamwork and leadership, aggression, anxiety, psychological response to athletic injuries and exercise addiction. 4 lectures.

KINE 278. Introduction to Perspectives in Physical Activity. 4 units

Term Typically Offered: W

Prerequisite: Completion of GE Area A with a grade of C- or better; and GE Area C2. Recommended: PHIL 230 or PHIL 231.

Current and historical trends in human movement from philosophical perspectives including Western and Eastern intellectual traditions; exploration of the effects of culture on the view of the human body and the understanding of the role of physical activity and sport in people's lives. 4 lectures.

KINE 280. Assessment Team for Health Promotion Activities. 1 unit

CR/NC

Term Typically Offered: W, SP

Prerequisite: HLTH/KINE 250, HLTH/KINE 255, or HLTH/KINE 260.

Recommended: KINE 319 and STAT 218.

Introduction to multiple health and fitness assessment protocols through participation in community-based activities and/or as assistants on faculty-led research projects. Experiential and service learning. Total credit limited to 3 units. Credit/ No Credit grading only. 1 activity. Crosslisted as HLTH/KINE 280.

KINE 281. Health Ambassadors. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: HLTH/KINE 250, HLTH/KINE 255, or HLTH/KINE 260.

Recommended: FSN 210 and HLTH/KINE 265.

Introduction to health education and promotion strategies through participation in community-based activities and/or as assistants on faculty-led projects. Experiential and service learning. Field trip required. Total credit limited to 3 units. Credit/No Credit grading only. 1 activity. Crosslisted as HLTH/KINE 281.

KINE 290. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

KINE 297. Medical Terminology. 3 units

CR/NC

Term Typically Offered: W, SP

Prerequisite: Completion of GE Area B2.

Development of medical vocabulary used in health care occupations, through the study of root words, prefixes, suffixes, and case studies. Pronunciation, spelling, and use of medical terms and abbreviations related to diagnosis, clinical procedures, surgery, and anatomical and physiological systems. Course offered online only. Credit/No Credit grading only. 3 lectures. Crosslisted as HLTH/KINE 297.

KINE 298. Disease Epidemiology. 4 units

Term Typically Offered: W, SP

Prerequisite: one of the following: HLTH/KINE 250; HLTH/KINE 255; HLTH/KINE 260; or HLTH/KINE 265. Recommended: BIO 161; MCRO 221 or MCRO 224; and STAT 217 or STAT 218.

Introduction to epidemiological principles and methods for studying chronic and communicable diseases in the United States. Upstream determinants of health and disease. Chronic disease continuum and epidemiologic triangle. Evidence-based recommendations for public health interventions. 3 lectures, 1 laboratory. Crosslisted as HLTH/KINE 298.

KINE 301. Functional Anatomy. 3 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 231 or BIO 409.

Functional organization of the human musculoskeletal system and articulations. Emphasis on the roles of muscles during activities of daily living, human performance settings, and the structure of freely movable joints. 3 lectures.

KINE 303. Physiology of Exercise. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 231; and BIO 232 or BIO 361. Recommended: CHEM 128.

Application of human physiology to exercise situations. 3 lectures, 1 laboratory.

KINE 304. Pathophysiology and Exercise. 3 units

Term Typically Offered: F, W

Prerequisite: KINE 303.

Selected human diseases, their etiology, pathophysiology, symptoms, diagnosis, effects on health and physical performance, and as affected by preventive or therapeutic exercise. 3 lectures.

KINE 305. Drugs in Society. 4 units

Term Typically Offered: W

Prerequisite: BIO 231; and one of the following: HLTH/KINE 250; HLTH/KINE 255; HLTH/KINE 260; or HLTH/KINE 443. Recommended: BIO 232.

Social, biological, and psychological factors of the major drugs associated with therapeutic and recreational use and abuse in society. Topics include drug use as a social problem, theories and treatment of addiction, how drugs work, and the detrimental health effects of drug use. Includes both illegal and legal drugs. 4 lectures. Crosslisted as HLTH/KINE 305.

KINE 308. Motor Development. 3 units

Term Typically Offered: F, SP

Prerequisite: GE D4.

Motor development of individuals from birth to maturity. Emphasis on interrelationship between motor and cognitive characteristics and affective needs and interests. Course may be offered in classroom-based or online format. 3 lectures.

KINE 310. Concepts and Applications in Elementary Physical Education. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing.

Movement as it relates to physical motor skill development, fitness, wellness, social development, cross-cultural understanding, and self-image. 2 lectures, 1 activity.

KINE 311. Strength Training Instruction. 1 unit

Term Typically Offered: TBD

Prerequisite: KINE 231, KINE 301.

Proper use of weight room resistance modalities including free weights and machine based exercises. Emphasis on effective and safe methods for leading individuals through an exercise session. 1 activity.

KINE 319. Introduction to Research Methods in Kinesiology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: STAT 217 or STAT 218.

Principles of reading and conducting research including contemporary research perspectives in kinesiology. Basic and applied research. Quantitative, qualitative, and mixed methods. 3 lectures, 1 laboratory.

KINE 320. Media and Technology in Health Promotion. 4 units

Term Typically Offered: W

Prerequisite: Completion of GE Area A with a grade of C- or better; KINE 180 or HLTH/KINE 265; and one of the following: HLTH/KINE 250; HLTH/KINE 255; or HLTH/KINE 260. Recommended: HLTH 299.

Applications of computers, electronic media and information technology as related to promoting health. Projects include digital videos, professional websites, ePortfolios, and blogs. 3 lectures, 1 laboratory. Crosslisted as HLTH/KINE 320.

KINE 323. Sport and Gender. 4 units

GE Area D5; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Areas A with a grade of C- or better; GE Area D1 and either D3 or D4.

Intersections between sport and gender in American society. Identification and discussion of the historical, sociological and psychological issues that affect the sport experiences of males and females, especially as they relate to class, race/ethnicity, sexuality, and political movements. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE D5 except for Kinesiology majors. Fulfills USCP.

KINE 324. Sports, Media and American Popular Culture. 4 units

GE Area D5; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Areas A with a grade of C- or better; and GE Area D1 and D3.

Issues of class, race/ethnicity, gender, various forms of deviance, and other aspects of social life. Exploration of sociological manifestations and implications of how the aforementioned social issues are embedded in mediated forms of sports. Kinesiology majors will not receive GE Area D5 credit. 3 lectures, 1 activity. Fulfills GE D5 and USCP.

KINE 330. Group Fitness Instruction. 2 units

Term Typically Offered: TBD

Prerequisite: KINE 301.

Overview of basic components of group fitness classes in school, corporate and commercial fitness settings. Development of instructional competencies in the primary components of a group fitness class. Instructional techniques, professionalism, leadership styles conducive to promoting exercise adherence. Application of basic theory related to human anatomy, biomechanics, exercise physiology, training principles and use of relevant ACSM guidelines. 2 activities.

KINE 366. Applied Sport Psychology. 3 units

Term Typically Offered: TBD

Prerequisite: KINE 266.

Psychological considerations of the coach-athlete relationship and mental preparation of teams and individuals for competition and practice. Application of sport psychology principles to develop a psychological skills training program appropriate to enhance performance and well-being in sport or exercise contexts. 3 lectures.

KINE 400. Special Problems for Advanced Undergraduates. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter.

KINE 401. Managing Exercise and Health Programs. 3 units

Term Typically Offered: F, SP

Prerequisite: KINE major and senior standing.

Planning, organizing and controlling programs in public, commercial, private and clinical exercise and health program settings. Emphasis on legal, ethical and budgetary considerations. 3 lectures.

KINE 402. Motor Learning and Control. 4 units

Term Typically Offered: F, W, SP

Prerequisite: STAT 217 or STAT 218 or equivalent coursework.

Variables which control sensory-motor integration. Analysis of factors which affect the acquisition of motor skills as related to the learning process and the learning environment. 3 lectures, 1 activity.

KINE 403. Biomechanics. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PHYS 121; KINE 301.

Fundamental biomechanical concepts and their application to human systems including examination of activities of daily living and performance settings. Examination of the effects of chronic and acute loading on the body. 3 lectures, 1 laboratory.

KINE 406. Neuroanatomy. 4 units

Term Typically Offered: TBD

Prerequisite: BIO 231 and BIO 232; or ZOO 331 and ZOO 332, or BIO 361.

Structure and function of the human nervous system. Afferent and efferent pathways involved in perception and action. Behavioral aspects of motor control and related neurological dysfunction and pathologies. Designed for allied health professions students. 4 lectures.

KINE 407. Adapted Physical Activity. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and completion of GE Areas B2 and B3.

Major categories of disabling conditions with implications for the development of physical activity programs for specific disabilities. 3 lectures, 1 laboratory.

KINE 408. Exercise and Health Gerontology. 3 units

Term Typically Offered: F, W, SP

Prerequisite: KINE 230 and KINE 231; or KINE 330; or KINE 459; and one of the following: KINE 250, KINE 255, or KINE 260.

Special fitness, exercise, and health needs of elder adults. Theories of aging and age-related changes. Health and physical activity programs for elder adults. 2 lectures, 1 activity.

KINE 409. Interdisciplinary Study in Biomechanics. 4 units

Term Typically Offered: F

Prerequisite: KINE 403; or ME 326.

Examination of human motion biomechanics. Experimental and analytical methods in motion analysis based on rigid body dynamics. Protocols for protection of human subjects in research. Hypothesis-driven research in interdisciplinary teams, including written proposal development and written/oral communication of results to a scientific audience. 1 lecture, 3 activities. Crosslisted as BMED/KINE/ME 409.

KINE 434. Health Promotion Program Planning. 4 units

Term Typically Offered: F, W, SP

Prerequisite: HLTH/KINE 265; HLTH/KINE 298; and KINE 266 or HLTH 334.

Application of methods to facilitate behavior change to promote health and prevent morbidity and mortality. Concepts affecting health behavior, motivation, and decision making. Development of program planning skills in health education and promotion. 3 lectures, 1 laboratory. Crosslisted as HLTH/KINE 434.

KINE 435. Health Promotion Program Implementation and Evaluation. 4 units

Term Typically Offered: SP

Prerequisite: HLTH/KINE 320; and HLTH/KINE 434.

Implementation and evaluation of health promotion programs in school, community, medical, public health, worksite, and college/university settings. Planning the intervention design, implementation and evaluation protocols including process, impact and outcome assessments. 3 lectures, 1 laboratory. Crosslisted as HLTH/KINE 435.

KINE 437. Directed Fieldwork. 1-3 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Senior standing.

Practical work experience in related activities of kinesiology under qualified supervision. Total credit limited to 9 units. Credit/No Credit grading only. Minimum of 2 laboratory hours per week per unit.

KINE 438. Adapted Physical Activity Fieldwork. 1-3 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: KINE 407.

Practical experience in adapted physical activity programming. Students plan and conduct physical activity programs for people who are disabled. Total credit limited to 6 units. Credit/No Credit grading only.

KINE 440. Physical Education Practicum. 1 unit

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Supervised experience involving organizational and instructional responsibilities in activity, lecture and/or laboratory classes as determined by curricular concentration or certificate program. Total credit limited to 3 units.

KINE 443. Health Education for Teachers. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Areas B2 and D4; and junior standing.

The health status, special concerns and national health objectives for school aged children. Coordinated school health programs and California Health Framework. Health, nutrition, safety, alcohol, tobacco and other drugs, reproductive health, and chronic disease prevention. Satisfies CTC requirement for credential. 4 lectures. Crosslisted as HLTH/KINE 443.

KINE 445. Electrocardiography. 4 units

Term Typically Offered: F, W, SP

Prerequisite: KINE 303.

Basic principles of electrocardiography, including practical skills of the ECG technician. Recognition of normal ECG patterns and abnormal changes related to rhythm disturbances, conduction defects, myocardial ischemia/infarction, and exercise. 3 lectures, 1 laboratory.

KINE 446. Echocardiography. 4 units

Term Typically Offered: SP

Prerequisite: KINE 445.

Basic principles of echocardiography, including practical skills of the echocardiographer. Recognition of normal echocardiographic patterns and abnormalities, including those caused by pathology and exercise conditioning. 2 lectures, 2 laboratories.

KINE 449. Exercise Prescription and Leadership. 3 units

Term Typically Offered: F, W, SP

Prerequisite: KINE 230 and KINE 231; or KINE 330; or KINE 459; and KINE 304 and KINE 445.

Use of medical history, physical examination, laboratory and exercise testing data for establishment of appropriate exercise programs for healthy adults and those with chronic and acute disease. Exercise leadership for normal and clinical populations. 2 lectures, 1 laboratory.

KINE 450. Worksite and University Health Promotion Programs. 4 units

Term Typically Offered: SP

Prerequisite: one of the following: HLTH/KINE 250; HLTH/KINE 255; or HLTH/KINE 260; and KINE 266 or HLTH 334. Recommended: HLTH/KINE 320.

Planning, implementing, and evaluating comprehensive worksite/ university health promotion (WHP) and campus wellbeing programs. Benefits of WHP for employers and employees. Educational, organizational, economic, and environmental supports for behaviors conducive to health. 4 lectures. Crosslisted as HLTH/KINE 450.

KINE 451. Nutrition for Fitness and Sport. 3 units

Term Typically Offered: F, SP

Prerequisite: KINE 250, KINE 255 or KINE 260; KINE 303. Recommended: FSN 210.

Application of nutritional and metabolic facts to selected aspects of physical training, degenerative disease, obesity and weight control, diet manipulation and modification in sport, nutritional supplementation and special dietary considerations for the young and old, male and female athletes. 3 lectures.

KINE 452. Exercise Testing and Prescription for Fitness Specialists. 4 units

Term Typically Offered: F, W, SP

Prerequisite: KINE 303. Recommended: KINE 445.

Selected areas of health/fitness screening and evaluation. Application of components relevant to the development and administration of exercise programs for persons regardless of sex, age, functional capacity and presence or absence of CHD or CHD risk factors. 3 lectures, 1 laboratory.

KINE 453. Obesity Prevention and Treatment. 4 units

Term Typically Offered: W

Prerequisite: FSN 210 or KINE 451; and one of the following: HLTH/KINE 298, KINE 304, or FSN 310. Recommended: HLTH 405; and one of the following: KINE 266, HLTH 334, or FSN 415.

Overview of research on the causes and consequences of obesity. Evidence-based prevention and treatment interventions. Emphasis on skills for promoting weight control in multidisciplinary health promotion and public health settings. 3 lectures, 1 activity. Crosslisted as HLTH/ KINE 453.

KINE 454. Exercise Metabolism. 3 units

Term Typically Offered: SP

Prerequisite: KINE 303; CHEM 216 or CHEM 312. Recommended: CHEM 313.

Advanced understanding of endocrine, metabolic, and physiological responses to physical activity, exercise and nutrition. How physical activity impacts human storage, delivery, and use of fuel required for energy conversion. 3 lectures.

KINE 459. Personal and Group Fitness Instruction. 3 units

Term Typically Offered: F, W, SP

Prerequisite: KINE 301; KINE 303; and KINE 402.

Instructional competencies in the primary components of a group fitness class and individually tailored personal fitness programs. Instructional techniques, professionalism, leadership styles conducive to promoting exercise adherence. Application of basic theory related to human anatomy, motor learning, exercise physiology, training principles and relevant ACSM guidelines. 1 lecture, 2 activities.

KINE 460. Experiential Senior Project. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: KINE 319; completion of GE Area A with a grade of C- or better; and senior standing.

A comprehensive applied capstone experience that integrates content from Kinesiology courses under faculty supervision. Projects must be approved by the supervising faculty member. Minimum 30 hours. Credit/ No Credit grading only.

KINE 461. Senior Project Report. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: KINE 319 and completion of GE Area A with a grade of C- or better.

A comprehensive synthesis of professional literature that integrates content from kinesiology courses resulting in a report. Topic must be approved by the instructor. Minimum 30 hours.

KINE 462. Research Honors Senior Project. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: KINE 319; completion of GE Area A with a grade of C- or better; and consent of instructor.

Completion of an advanced research, or creative project. Intended for students taking a significant or leadership role in a professional area. Results may be submitted for poster presentation or other public/professional forum. Total credit limited to 4 units.

KINE 463. Exercise Science and Health Promotion Fieldwork. 1-3 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Junior or senior standing and minimum GPA of 2.0.

Practical experience at an approved agency that provides exercise/fitness/health promotion programs. Students participate in program administration under the direct supervision of an approved on-site coordinator. Credit/No Credit grading only. Total credit limited to 3 units.

KINE 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

KINE 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

KINE 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 12 units. Credit/No Credit grading only.

KINE 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 24 units. Credit/No Credit grading only.

KINE 500. Individual Study. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: KINE 517, graduate standing, and consent of instructor.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements.

KINE 501. Evaluation of Literature and Current Trends in Kinesiology. 3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Analysis and evaluation of published studies and current trends in kinesiology. 3 seminars.

KINE 503. Current Health Issues. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Current issues and trends in health, disease prevention, and the healthcare system. Socioeconomic, biologic, environmental, institutional and policy factors that influence health status, disparities in health, and positive health outcomes. 4 seminars.

KINE 504. Advanced Pathophysiology and Exercise. 3 units

Term Typically Offered: TBD

Prerequisite: graduate standing. Recommended: KINE 303 or equivalent.

Selected human diseases, their etiology, pathophysiology, symptoms, diagnosis, effects on health and physical performance, and as affected by preventive or therapeutic exercise. 3 lectures.

KINE 505. Introduction to Issues, Ethics and Policies in Teaching Kinesiology. 2 units

CR/NC

Term Typically Offered: F

Prerequisite: Graduate standing.

Knowledge, skills, preparation and support for teaching Kinesiology activity and laboratory classes in the department. Prepares students to be supervisors and teachers in their current or future employment. Credit/No Credit grading only. 1 seminar, 1 activity.

KINE 510. Advanced Health Behavior Change Programs. 3 units

Term Typically Offered: TBD

Prerequisite: KINE 503 or KINE 504 and graduate standing.

Examination of contemporary research, theory and practice related to facilitating healthy behavior change. Analysis of health problems from biological, ecological, and psycho-social perspectives with emphasis on understanding the acquisition and maintenance of healthy behavior. 3 seminars.

KINE 511. Administration in Exercise and Health Settings. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Principles and techniques of administration in health, physical activity, and academic settings including budget, personnel supervision, risk management, leadership techniques, and facility management. 4 seminars.

KINE 517. Research Methods in Kinesiology. 4 units

Term Typically Offered: TBD

Prerequisite: KINE 501. Recommended: STAT 512 or STAT 513.

Quantitative, qualitative and mixed methods approaches to research in kinesiology. Selection of adequate problems for investigation; various sampling techniques and analyses; use of library facilities; manuscript requirements for the thesis. 4 seminars.

KINE 518. Research Prospectus and Proposal Writing. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: KINE 517.

Strategies for identifying academically valid research topics. Planning considerations for qualitative and quantitative research including grant writing, human subjects review, personnel, equipment, and timelines. Design and composition of effective research proposals. Credit/No Credit grading only. 2 seminars.

KINE 522. Advanced Biomechanics. 4 units

Term Typically Offered: W

Prerequisite: KINE 403.

Advanced biomechanical concepts applied to human movement, examination of research, and biomechanical analyses of movement activities. Performance, occupational, and clinical settings. Laboratory techniques including motion analysis, force platform, and electromyography. 3 seminars, 1 laboratory.

KINE 525. Advanced Motor Learning and Control. 3 units

Term Typically Offered: SP

Prerequisite: KINE 402 or equivalent.

Analysis of control theories, research principles and motor learning variables involved in the acquisition of skilled movement with an emphasis on the behavioral level of learning. 3 seminars.

KINE 526. Advanced Sport and Exercise Psychology. 3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Theoretical and professional issues in the psychological foundations of sport and exercise. 3 seminars.

KINE 530. Advanced Physiology of Exercise. 4 units

Term Typically Offered: SP

Prerequisite: KINE 303 and graduate standing.

Physiological determinants of physical work capacity and sports performance. 3 seminars, 1 laboratory.

KINE 536. Advanced Electrocardiography. 4 units

Term Typically Offered: W

Prerequisite: KINE 445.

Theory and application of electrocardiography and other techniques for cardiovascular assessment and treatment of cardiac disease and other abnormalities. 3 seminars, 1 laboratory.

KINE 537. Internship. 3-12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing; consent of instructor.

Supervised work experience in an approved wellness/fitness clinical facility, school, or other faculty approved setting. Total credit limited to 12 units. Maximum of 6 units may be applied toward Master of Science in Kinesiology. Credit/No Credit grading only.

KINE 539. Effective Practice in Teaching and Coaching. 3 units

Term Typically Offered: F

Prerequisite: Graduate standing.

Observation and analysis of teaching physical education and coaching sports with special emphasis in pedagogical systems. 2 seminars, 1 laboratory.

KINE 570. Selected Advanced Topics. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 4 lectures.

KINE 581. Graduate Seminar in Kinesiology. 1-3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Directed group study of selected topics for advanced students. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 1-3 seminars.

KINE 585. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only.

KINE 599. Thesis or Project. 1-6 units

Term Typically Offered: F, W, SP

Prerequisite: KINE 517, KINE 518 and consent of instructor.

Completion of a thesis or project pertinent to the field of kinesiology. Independent research under the guidance of the faculty.

Landscape Architecture (LA)

LA Courses

LA 101. Introduction to Landscape Architecture. 4 units

Term Typically Offered: F

Introduction to the profession of landscape architecture and orientation to the department curriculum and learning processes. 4 lectures.

LA 170. Principles of Design Communication. 4 units

Term Typically Offered: F, SP

Overview of design communications for landscape architects incorporating the principles, techniques, skills and tools used in design generation, exploration, review and implementation. 4 laboratories.

LA 171. Principles of Digital Communication. 4 units

Term Typically Offered: W

Introduction of digital media applications, software and techniques for landscape architects. Principles, techniques, skills and tools for using digital media in design projects. 4 lectures.

LA 202. Design Fundamentals I. 4 units

Term Typically Offered: F

Corequisite: LA 170.

Introduction to the principles, methods and elements of two- and three-dimensional design in order to communicate intended concepts and meanings. Exploration of the basic design elements including composition, design process and the creation of spatial settings. 4 laboratories.

LA 203. Design Fundamentals II. 4 units

Term Typically Offered: W

Prerequisite: LA 202, LA 243. Concurrent: LA 241.

Continuation of ideas introduced in LA 202 with the introduction of environmental and visual perception, including three-dimensional site design and landscape architectural design principles. Spatial design and sequencing of space with concern for human behavioral, environmental and natural site factors and generation of program, concept and design development. 4 laboratories.

LA 204. Design Fundamentals III. 4 units

Term Typically Offered: SP

Prerequisite: LA 203, LA 241. Concurrent: LA 242.

Continuation of ideas introduced in LA 202 and LA 203 with the introduction of the principles of design theory, landscape ecology and technical applications. Problems of increasing complexity incorporate critical and creative problem solving, the relationship of aesthetics, response to human needs and design for sustainable environments. 4 laboratories.

LA 211. History of Landscape Architecture: Ancient Civilizations through Colonial America. 4 units

GE Area C3

Term Typically Offered: W, SU

Exploration of the continuous alteration of the landscape through recorded time and examination of how humankind has influenced this change. The metaphor of 'garden' provides understanding for agrarian regions, urban spaces, and vernacular landscapes of the world. 4 lectures. Fulfills GE C3.

LA 212. History of Modern and Contemporary Landscape Architecture. 4 units

GE Area C3

Term Typically Offered: F, SP, SU

Philosophies and ethics of important personalities in twentieth and twenty-first century landscape architecture. Design theories supporting these individuals' projects and the nature of their practice, combined with the influential events in industry, the arts and sciences, politics, and society of these centuries. 4 lectures. Fulfills GE C3.

LA 218. Applications in GIS. 3 units

Term Typically Offered: TBD

ARC/INFO and ArcView Geographic Information System (GIS) computer software to explore environmental, natural resource, social and economic issues using spatial data. Develop and apply data base and software management competencies. 1 lecture, 2 laboratories. Crosslisted as LA/NR 218.

LA 220. Landscape Ecology: Concepts, Issues and Interrelationships. 4 units

GE Area B5

Term Typically Offered: F

Concepts, theories and techniques related to landscape analysis, ecology, planning and design with an emphasis on landscape assessment, sustainability, land health, environmental protection and restoration, and natural resource management. 4 lectures. Fulfills GE B5.

LA 221. California Plants and Plant Communities. 4 units

Term Typically Offered: SP

Prerequisite: BIO 114 or BOT 121.

Introduction to the horticultural characteristics and landscape design potential of California native plants, California plant communities and associated vernacular plants. Includes experience in field identification, basic planting design, installation techniques and maintenance requirements. Required field trips. 2 lectures, 2 laboratories.

LA 241. Site Engineering Techniques and Applications. 4 units

Term Typically Offered: W

Prerequisite: LA 202, LA 243. Corequisite: MATH 118. Concurrent: LA 203.

Introduction and application of the techniques, methods, principles and criteria for site engineering and landform design. Includes an introduction to soil science, survey methods, and experiences in the principles, procedures and application of site grading and drainage for landscape architecture. 4 laboratories.

LA 242. Implementation Strategies. 4 units

Term Typically Offered: SP

Prerequisite: LA 203, LA 241. Concurrent: LA 204.

Introduction and application of the methods, principles and criteria for landscape implementation. Encompasses fundamental design and technical decisions common to landscape architectural design and construction projects including the development of concept, design development and working drawings, and construction management process. 3 lectures, 1 activity.

LA 243. Materials and Techniques of Landscape Construction. 4 units

Term Typically Offered: F

Corequisite: LA 170. Concurrent: LA 202.

Introduction to the properties, uses and inherent qualities of the fundamental materials of landscape architectural concerns and associated construction techniques and processes. Materials and techniques explored as a source of design ideas, form and expression in landscape architecture. 3 lectures, 1 activity.

LA 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

LA 317. The World of Spatial Data and Geographic Information Technology. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B2.

Basic foundation for understanding the world through geographic information and tools available to utilize spatial data. Application of Geographic Information Systems (GIS) and related technologies, including their scientific basis of operation. Not open to students with credit in LA/NR 218. 3 lectures, 1 activity. Crosslisted as LA/NR 317. Fulfills GE Area F.

LA 320. Design Theory for Landscape Architects. 4 units

Term Typically Offered: F

Prerequisite: LA 211, LA 212, or consent of instructor.

Complements the material and knowledge presented in the history of landscape architecture, architecture and art courses. Design theory and associated concepts as they are related to landscape architecture. Literature research and analysis of completed design projects. The artists/designers, materials and overall expressions of work are related to the social and economic issues of the time as well as their associations with the other arts and sciences. 4 lectures.

LA 330. Cultural Landscapes: People, Places and Ethical Decisions. 4 units

Term Typically Offered: F

Prerequisite: LA 211, LA 212.

Investigation of the complexities and interrelatedness of culture, environment and ethical decisions. Interpretation of personal and cultural values and ethics in terms of decisions made and behaviors and actions expressed in the built landscape. 4 lectures.

LA 349. Advanced Planting Design. 4 units

Term Typically Offered: SP

Prerequisite: AEPS 233; AEPS 234; and AEPS 381 or LA 221.

Advanced examination of the theories and applied principles of planting design. Emphasis on connections between art and science in the design of parks, gardens and other landscapes. Case studies and field trips. 2 lectures, 2 activities.

LA 350. Advanced Landscape Construction. 4 units

Term Typically Offered: SP

Prerequisite: LA 242.

Examination and application of advanced landscape construction techniques. Emphasis on design, development, construction, and testing of contemporary landscape technologies and practices. Field trip may be required. 2 lectures, 2 laboratories.

LA 370. Professional Practice. 4 units

Term Typically Offered: W

Prerequisite: LA 204.

Issues related to the practice of landscape architecture incorporating processes, procedures and outcomes of professional practice. Topics include professional ethics, business and legal aspects of the profession, relationships to the client and society, personal goal setting, resume and portfolio preparation. 4 lectures.

LA 371. Internship. 3 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Third year standing in Landscape Architecture.

Involvement in a work setting related to landscape architecture. Thirty hours work experience per unit of credit. Credit/No Credit grading only.

LA 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

LA 401. Research Project. 2 units

Term Typically Offered: F, SP

Prerequisite: Completion of four design focus studios (16 units from LA 402 - LA 405).

Research methods in landscape architecture and proposal writing techniques. Students prepare proposal and strategy for fifth year study in area of concentration. 2 seminars.

LA 402. Design Theory and Exploration Focus Studio. 4 units

Term Typically Offered: F, W, SU

Prerequisite: LA 204, LA 211, LA 212 or consent of instructor. Concurrent: Integrated Learning Course (ILC) of student's option.

Exploration and application of design theory, exploratory design process and form exploration to design and planning projects. Emphasis on incorporation of inquiry techniques based on the synthesis of interdisciplinary frameworks of art and design theory with historical and cultural issues. Total credit limited to 12 units. 4 laboratories.

LA 403. Natural Environments Design Focus Studio. 4 units

Term Typically Offered: W, SP

Prerequisite: LA 204, LA 211, LA 212 or consent of instructor. Corequisite: LA 220. Concurrent: Integrated Learning Course (ILC) of student's option.

Assessment, exploration and integration of landscape ecology, sustainability and environmental planning to design and planning projects. Emphasis on interpretation and application of environmental and ecological issues at a range of design scales. Total credit limited to 12 units. 4 laboratories.

LA 404. Cultural Environments Design Focus Studio. 4 units

Term Typically Offered: F, W, SP

Prerequisite: LA 204, LA 211, LA 212 or consent of instructor. Concurrent: Integrated Learning Course (ILC) of student's option.

Assessment, exploration and interpretation of cultural values, issues and landscapes to design and planning projects. Emphasis on observation and inquiry of diverse cultural settings, differences in cultural values and personal ethics in the design process. Total credit limited to 12 units. 4 laboratories.

LA 405. Project Design and Implementation Focus Studio. 4 units

Term Typically Offered: F, W

Prerequisite: LA 204, LA 243, LA 242, LA 241 or consent of instructor.

Concurrent: Integrated Learning Course (ILC) of student's option.

Development, exploration and integration of project design and implementation strategies to design and planning projects. Emphasis on creative and exploratory problem solving, spatial design, project resolution, and graphic communication. Total credit limited to 12 units. 4 laboratories.

LA 406. Interdisciplinary Design Studio. 4 units

Term Typically Offered: W, SP

Prerequisite: LA 402, LA 405 or consent of instructor. Concurrent:

Integrated Learning Course (ILC) of student's option.

Design studio with focus on interdisciplinary modes of practice and collaborative approaches to design. Interdisciplinary design process may be explored through project program and collaboration with students in allied majors. Field trip required. Total credit limited to 12 units. 4 laboratories.

LA 431. CAD and Digital Media Communications (ILC). 4 units

Term Typically Offered: F, W, SP

Prerequisite: LA 170, LA 204 or consent of instructor.

Integrated Learning Course (ILC) to assist integration and application of computer-aided drafting (CAD) skills in coursework, project planning and design studio courses. Focus on CAD skills and integration of digital media. Total credit limited to 12 units. 4 activities.

LA 432. Landscape Ecology Applications (ILC). 4 units

Term Typically Offered: F, W, SP

Corequisite: LA 220. Concurrent: Design Focus Studio of student's option.

Integrated Learning Course (ILC) to assist integration and application of landscape ecology principles in project planning and design studio courses. Focus on understanding and developing a framework for ecological planning and design to anticipate consequences of planning and design decisions. Total credit limited to 12 units. 4 activities.

LA 433. Cultural Environments (ILC). 4 units

Term Typically Offered: F, W, SP

Prerequisite: LA 211. Concurrent: Design Focus Studio of student's option.

Integrated Learning Course (ILC) to assist integration and application of culture, environment and personal ethics in coursework, project planning and design studio courses. Focus on skills, distinctions and integration of analyzing the cultural landscape, understanding diverse cultural values and assessing personal ethics. Total credit limited to 12 units. 4 activities.

LA 434. Project Design and Implementation (ILC). 4 units

Term Typically Offered: F, W, SP

Prerequisite: LA 241, LA 242, LA 243 or consent of instructor. Concurrent: Design Focus Studio of student's option.

Integrated Learning Course (ILC) to assist integration and application of project design principles and implementation strategies in project planning and design studio courses. Focus on skills, techniques and decisions of the design, documentation and construction processes. Total credit limited to 12 units. 4 activities.

LA 435. Professional Practice (ILC). 4 units

Term Typically Offered: F, W, SP

Concurrent: Design Focus Studio of student's option.

Integrated Learning Course (ILC) to assist integration and application of professional practice principles and techniques in planning and design studio and internship courses. Focus on achieving a high level of professional quality, ethical concern, and legal responsibility in project work. Total credit limited to 12 units. 4 activities.

LA 436. Traditional and Digital Media Communications (ILC). 4 units

Term Typically Offered: F, W, SP

Prerequisite: LA 170, LA 202, LA 203, LA 204 or consent of instructor.

Concurrent: Design Focus Studio of student's option.

Integrated Learning Course (ILC) to assist integration and application of graphic communication and presentation skills in coursework, project planning and design studio courses. Focus on skills, distinctions and integration of traditional and digital media explorations. Total credit limited to 12 units. 4 activities.

LA 437. 3D Digital Design Communications (ILC). 4 units

Term Typically Offered: F, W, SP

Prerequisite: LA 170, LA 204 or consent of instructor. Concurrent: Design Focus Studio of student's option.

Integrated Learning Course (ILC) to assist integration and application of 3D digital graphic communication and presentation skills in coursework, project planning and design studio courses. Focus on skills and integration of three-dimensional digital media explorations. Total credit limited to 12 units. 4 activities.

LA 438. GIS Application to Design Projects (ILC). 4 units

Term Typically Offered: F, W, SP

Corequisite: LA 220. Concurrent: Design Focus Studio of student's option.

Integrated Learning Course (ILC) to assist integration and application of geographic information systems (GIS) and spatial information into focus design studio courses. Total credit limited to 12 units. 4 activities.

LA 439. Planting Design (ILC). 4 units

Term Typically Offered: F, W, SP

Prerequisite: LA 221. Concurrent: Design Focus Studio of student's option.

Integrated Learning Course (ILC) to assist the integration and application of plant selection, use and appropriateness in planning and design studio courses. Focus is on the skills, theories and principles of planting design. Total credit limited to 12 units. 4 activities.

LA 461. Senior Design Project Focus Studio. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of Design Focus Sequence (20 units from LA 402-LA 405).

Comprehensive landscape architectural design and research project showing professional level competency in the integration of design theory, landscape architectural principles and project resolution. Emphasis on creative resolutions, organization and communication skills and technical abilities in program generation, design process, design and research. Total credit limited to 8 units. 4 laboratories.

LA 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 lectures.

LA 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 laboratories.

LA 482. Evaluating Social and Behavioral Factors for Open Space Design. 4 units

Term Typically Offered: TBD

Prerequisite: Fourth-year or graduate standing.

User oriented approach to open space design. Interview and survey techniques, behavioral trace mapping and systematic observation, post occupancy evaluation and similar methods are used to generate user input and feedback in the design process. Understanding the behavioral implications of designed environments. 2 lectures, 2 activities.

LA 483. Special Studies in Landscape Architecture. 1-12 units

Term Typically Offered: TBD

Prerequisite: Fourth- or fifth-year standing.

Special issues and problems through research, field trips, seminars and other forms of investigation and involvement. Course requirements are determined prior to each individual project through a contractual agreement between students and department. Departmental Off Campus Study Program guidelines apply. Total credit limited to 36 units. 1-12 activities.

LA 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Junior standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 18 units. Credit/No Credit grading only.

LA 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Junior standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 24 units. Credit/No Credit grading only.

LA 585. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and part-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Total credit limited to 9 units. Credit/No Credit grading only.

LA 595. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Advanced study analysis and full-time work experience in student's career field; current innovations, practices, and problems in administration, supervision, and organization of business, industry, and government. Must have demonstrated ability to do independent work and research in career field. Credit/No Credit grading only.

Liberal Arts and Engineering Studies (LAES)

LAES Courses

LAES 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

LAES 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

LAES 301. Project-Based Learning in Liberal Arts and Engineering Studies. 4 units

Term Typically Offered: F, SP

Prerequisite: MATH 241; PHYS 132; PHYS 133; and GE Area A with a grade of C- or better.

Examination of how to define LAES as a new field of study; analysis of the creative process and team building in theory and in application. Researching, writing, revising and presenting a technical proposal suitable for submission to a national design competition seeking innovative solutions to complex technological/social problems. 2 seminars, 2 activities.

LAES 302. Advanced Project-Based Learning in Liberal Arts and Engineering Studies. 4 units

Term Typically Offered: F, SP

Prerequisite: LAES 301.

Teamwork and leadership in project-based learning. Students lead, build, and maintain project teams; guide the creative process; and use and evaluate the principles of project management in theory and practice. Development of a technical proposal suitable for submission to a national design competition seeking innovative solutions to complex technological/social problems. 2 seminars, 2 activities.

LAES 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

LAES 411. Global Synthesis in Liberal Arts and Engineering Studies. 4 units

Term Typically Offered: TBD

Prerequisite: LAES 302; junior standing.

Onsite work with a global technical development and/or design team to develop a project to be completed/expanded upon in LAES 461. Through guided online discussion with the instructor and fellow LAES students, work through intercultural collaboration and design issues, and present works-in-progress. 4 lectures.

LAES 430. Internship. 2-12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Approval of area chair, junior standing, and a CPSLO cumulative GPA of at least 2.5 without being on academic probation.

Work experience in business, industry, government and other areas of student career interest. Periodic written progress reports, final report, and evaluation by work supervisor required. Credit/No Credit grading. Total credit limited to 12 units.

LAES 461. Senior Project in Liberal Arts and Engineering Studies. 4 units

Term Typically Offered: F, W, SP

Prerequisite: LAES 302; senior standing; and permission of instructor.

Under faculty supervision, the selection and completion of a senior project, demonstrating an interdisciplinary focus in LAES. With one-on-one format with the instructor, individual or small group work through many iterations of the senior project, with occasional showing of works in small student groups.

LAES 462. Capstone Senior Seminar in Liberal Arts and Engineering Studies. 4 units

Term Typically Offered: F, W, SP

Prerequisite: LAES 461.

The final refinement and completion of LAES senior projects and other projects. In a development workshop format, presentation of final versions of works-in-progress to combined faculty and professional review committees throughout the quarter.

LAES 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

LAES 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

LAES 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 18 units. Credit/No Credit grading only.

LAES 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. Major credit limited to 6 units; total credit limited to 24 units.

Liberal Studies (LS)

LS Courses

LS 201. Orientation to Liberal Studies. 1 unit

Term Typically Offered: F

Career and academic planning, co-curricular, extra-curricular opportunities, and pathway into a K-8 teaching profession. Academic policies and procedures, goal settings, elements of career in education, and other topics relevant to student and professional success. Intended for new students in the Liberal Studies major. Not open to students with credit in LS 101. 1 activity.

LS 211. Visual Arts in the Elementary Classroom. 4 units

Term Typically Offered: F, W, SP

Theory, aesthetics, appreciation and applications of visual arts, through multiple two dimensional art strategies, as related to educational processes for the elementary classroom. Focus on elements, principles of design while fostering artistic perception. One Saturday field trip required. 3 lectures, 1 laboratory.

LS 214. Constitutional Issues in the History of U.S. and California Education. 4 units

Term Typically Offered: F, W, SP

Examination of U.S. and California constitutions, significant legislation, and court cases affecting public education from the colonial period to the present. Overview of contributions by individuals of historical, national, and international educational significance. Examination of landmark decisions. 4 lectures.

LS 230. Field Experience in the Elementary Classroom I. 2 units

Term Typically Offered: F, W, SP

Overview of current practices and issues in elementary education, including teacher compensation, cultural impact on schools, time and classroom management, English learners, and the affective aspect of teaching. 24 hours of fieldwork required. 2 activities.

LS 250. Field Experience in the Elementary Classroom II. 2 units

Term Typically Offered: F, W, SP

Overview of current practices and issues in elementary education, including components of effective teaching, motivating students, diagnostic/prescriptive teaching, curriculum, and accountability. In addition to class time, 24 hours of fieldwork required. Participation in public schools requires fingerprint clearance. 2 activities.

LS 260. Children's Literature. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

Analysis and evaluation of traditional literature, fantasy, realistic fiction, historical fiction, informational books, picture books, and poetry for children in multiple subject classroom grades K-6. Emphasis on multicultural texts. 4 lectures. Crosslisted as ENGL/LS 260.

LS 290. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

LS 301. Liberal Studies Career Preparation. 1 unit

Term Typically Offered: F, SP

Prerequisite: Junior standing. Corequisite: LS 201.

Overview of ethical, legal, and historical issues in education; major foundational philosophies in American public education. Career pathways in education, targeted advising, portfolio building and professional goals and opportunities. Not open to students with credit in LS 101. 1 activity.

LS 305. Project Based Learning in STEM Education. 2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Completion of GE Area B.

Extended collaborative study of a question or problem in STEM using a Project Based Learning (PBL) environment; includes consideration of the educational framework and principles of PBL. Topics will have an engineering design component that will require application of mathematics, technology, and science. The Schedule of Classes will list topic selected. Total credit limited to 4 units. Credit/No Credit grading only. 2 activities.

LS 310. Storytelling: Modern Applications of Traditional Narrative. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A2 with a grade of C- or better.

Techniques for selection, preparation and presentation of traditional folktales and myths for an audience. Applications of storytelling in teaching and organizations; theory and history of folk literature and mythology. 4 lectures.

LS 370. Performing Arts in the Elementary Classroom. 4 units

Term Typically Offered: F, W, SP

Prerequisite: LS 211 and GE C3. Recommended: LS 310.

Current theory and practice of standards based performing arts with an emphasis on the use of music, theater, media arts and dance, as discrete disciplines with historical and cultural context in the classroom. Attendance at outside performances required. 4 lectures.

LS 380. Subject Matter Apprenticeship. 2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of instructor.

Structured application of a specific content area in schools and informal educational settings. Topics include: Arts, English, Science, Mathematics, History/Social Studies, and Physical Education and Health. The Schedule of Classes will list topic selected. Participation in public schools requires mandated fingerprint clearance. Total credit limited to 4 units. Credit/No Credit grading only. 2 activities.

LS 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor, junior standing.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

LS 410. Subject Matter Seminar. 4 units

Term Typically Offered: F, SP

Prerequisite: LS Majors and Senior standing.

Analysis and practice of subject matter knowledge and skills to facilitate K-8 learning through identifying major themes and questions. The use of inquiry, assessment, curriculum integration, and technology to connect discipline specific content to contemporary social issues. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 seminars, 1 activity.

LS 411. Advanced History/Social Sciences Integration for the K-8 Classroom. 4 units

Term Typically Offered: F, SP

Prerequisite: GEOG 308; HIST 208; LS major; and senior standing.

Analysis and practice of history and social sciences knowledge and skills to facilitate K-8 learning through identifying major themes and questions. The use of inquiry, assessment, curriculum integration, and technology to connect discipline specific content to contemporary social issues. 3 seminars, 1 activity.

LS 412. Advanced Arts Integration for the K-8 Classroom. 4 units

Term Typically Offered: SP

Prerequisite: LS 211 and senior standing.

Analysis and practice of Arts knowledge and skills to facilitate K-8 learning through identifying major themes and questions. The use of inquiry, assessment, curriculum integration, and technology to connect discipline specific content to contemporary social issues. Field trips required. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

LS 461. Senior Project Seminar. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing, completion of GWR or consent of instructor.

Examination of issues in education of state, national and international concern. Students prepare presentations and conduct individual research and analysis of selected problems. Substantial research paper required. 4 seminars.

LS 462. Senior Project Research. 2-4 units

Term Typically Offered: W

Prerequisite: Senior standing; completion of GWR; LS 410 or LS 411 or LS 412.

Application of content and theory to the educational experience of one specific subject matter area in the Liberal Studies program. Total credit limited to 4 units.

LS 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

Marine Science (MSCI)

MSCI Courses

MSCI 100. Introduction to Marine Sciences. 1 unit

CR/NC

Term Typically Offered: F

Prerequisite: Marine Sciences major.

Introduction to Marine Sciences faculty, the Biology Department and campus resources, research opportunities, possible careers, studying science, and current topics in marine sciences. Credit/No credit grading only. 1 lecture.

MSCI 301. Biological Oceanography. 3 units

Term Typically Offered: F

Prerequisite: BIO 160, BIO 161, BIO 263, PSC 201, CHEM 129, and STAT 218.

Interdisciplinary study of marine organisms, how they interact with each other and their physical, chemical and geological environment. Emphasis on how these interactions impact abundance, diversity and temporal and spatial distributions. 3 lectures.

MSCI 303. Ocean Sampling Techniques. 3 units

Term Typically Offered: F

Prerequisite: CHEM 302, MSCI 301, and STAT 218.

Introduction to techniques in oceanography and marine sciences. Hands-on technical training in sampling, measuring, tagging and tracking of bathymetry and geography; waves, tides and currents; salinity, temperature and pressure; dissolved oxygen and pH; irradiance and light scattering; phytoplankton and zooplankton; and benthic fauna and marine macrofauna. 1 lecture, 2 labs.

MSCI 307. World Aquaculture: Applications, Methodologies and Trends. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B, including a GE B2 course in biology with a BIO, BOT, or MCRO, or ZOO prefix.

Life histories and habitats of important species of fishes, invertebrates and algae. Methodologies for the commercial propagation of specific forms. Global and regional coverage, including socioeconomic trends, controversies and applications in developed and less developed regions of the world. Not open for major credit in Biological Sciences. 3 lectures, 1 activity. Fulfills GE Area F.

MSCI 324. Marine Mammals, Birds and Reptiles. 4 units

Term Typically Offered: TBD

Prerequisite: BIO 162; BIO 263; and STAT 218.

Introduction to the biology, ecology and evolution of mammals, reptiles and birds of the marine environment, with an emphasis on Central California species, diversity patterns, evolutionary relationships, adaptations to the ocean, and conservation issues. Field trips required. 2 lectures, 2 laboratories.

MSCI 328. Marine Ecology. 4 units

Term Typically Offered: W, SP

Prerequisite: BIO 160, BIO 162, and BIO 263. Recommended: STAT 218.

Introduction to the functional biology of marine plants and animals and the ecological processes that underlie their distribution and abundance in open oceans, coastal regions, and estuaries. Field trips required. 2 lectures, 2 laboratories.

MSCI 330. Technologies for Ocean Discovery. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B.

Survey of ocean sensor systems, sensor platforms, and other emerging technologies that provide new understanding of the ocean, current issues in marine science, and the social context and societal implications of discoveries in ocean sciences. Course projects could include presentations, data analysis, and hands-on design of sensors. Field trip required. 3 lectures, 1 activity. Fulfills GE Area F.

MSCI 401. Marine Science Outreach. 1-2 units

CR/NC

Term Typically Offered: W

Prerequisite: PSC 201 or MSCI 301 or MSCI 328; Junior standing and consent of instructor.

Volunteer or internship experience in a marine science business, industry, government agency or informal science center. Positions require communicating science to the public. Formal report and evaluation by work supervisor required. Major credit limited to 4 units. Total credit limited to 8 units. Credit/No credit grading only.

MSCI 410. Scientific Diving. 3 units

Term Typically Offered: SU

Prerequisite: BIO 263, open water diving certificate, and instructor consent. Recommended: MSCI 301 or MSCI 328.

Advanced training in scientific methods associated with practical training in scuba diving. Satisfies American Academy of Underwater Sciences standards. Combination of theory, techniques and scuba diving. Experience collecting data and handling scientific equipment underwater. AAUS certification will require additional assessments outside of class. Field trips and additional fee required. 1 lecture, 2 labs.

MSCI 428. Marine Conservation and Policy. 4 units

Term Typically Offered: W

Prerequisite: BIO 160 and BIO 263; BIO 327 or BIO 401 or BOT 326 or MSCI 328, or Graduate standing in Biological Sciences. Recommended: PSC 201.

Examination of how science and policy are used to evaluate and implement marine conservation and resource management. Topics include endangered species, fisheries, climate change, marine protected areas, research and conservation topics and developing policy for management decision-making. Field trip required. 3 lectures, 1 laboratory.

MSCI 437. Marine Botany. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing and BIO 162.

Comprehensive examination of the ecology, life histories, functional morphology, physiology, and taxonomy of marine algae and marine plants. Laboratory emphasizes species endemic to the central coast of California. 3 lectures, 1 laboratory.

MSCI 438. Aquaculture. 4 units

Term Typically Offered: TBD

Prerequisite: BIO 160, BIO 162, and BIO 263.

Propagation and rearing of fishes, invertebrates and algae from marine, freshwater, and estuarine habitats. Current methodologies and general life histories. Global perspective including aquacultural development in developed and developing countries. 3 lectures, 1 laboratory.

MSCI 439. Fisheries Science and Resource Management. 4 units

Term Typically Offered: SP

Prerequisite: BIO 162. Recommended: ZOO 322.

Scientific investigation of marine and freshwater fisheries. Methodologies and quantitative strategies for study of finfish and invertebrates. Role of oceanographic or limnological processes on stock maintenance. Impact of human exploitation on maintenance of sustainable yields, including user-group conflict issues, and regional/global controversies. Lab/field protocols, basic fisheries statistical procedures, molecular methods, computer simulations. 3 lectures, 1 laboratory.

MSCI 440. Communicating Ocean Sciences to Informal Audiences. 3 units

Term Typically Offered: TBD

Prerequisite: Junior standing; MSCI 328, PSC 201, ZOO 322, or ZOO 336; completion of GE A with a grade of C- or better; and GE Area B2 or BIO 211.

Simultaneous focus on developing a knowledge of ocean sciences and the advanced educational approaches for communicating that knowledge. Teaching skills developed through coursework, outreach events and design of collaborative projects at museums and aquariums. Primary objective is to learn how to present ocean-themed hands-on, inquiry-based science exhibits, in order to improve the scientific literacy of audiences of all ages. Field trip required. 1 lecture, 2 activities.

Materials Engineering (MATE)

MATE Courses

MATE 110. Introduction to Materials Engineering Design I. 1 unit

Term Typically Offered: F

Prerequisite: MATE majors only.

Laboratory work in teams to design, build and test a product. Material from math, science and engineering courses tied together. 1 laboratory.

MATE 120. Introduction to Materials Engineering Design II. 1 unit

Term Typically Offered: W

Prerequisite: MATE 110.

Second design laboratory, working in teams to design, build and test a complex system that benefits humanity. Focus on complete design process including project management, documentation in design, manufacturing techniques, and analysis of testing data. Issues of engineering ethics, technology and society, the environment and sustainability also studied. 1 laboratory.

MATE 130. Introduction to Materials Engineering Design III. 1 unit

Term Typically Offered: SP

Prerequisite: MATE 120.

Third design laboratory in a sequence. Includes working in teams on project that benefits humanity. Issues of engineering ethics, technology and society, the environment and sustainability. 1 laboratory.

MATE 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

MATE 210. Materials Engineering. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: CHEM 111 or CHEM 124 or CHEM 127. Recommended: Concurrent enrollment in MATE 215.

Structure of matter. Physical and mechanical properties of materials including metals, polymers, ceramics, composites, and electronic materials. Equilibrium diagrams. Heat treatments, materials selection and corrosion phenomena. 3 lectures.

MATE 215. Materials Laboratory I. 1 unit

Term Typically Offered: F,W,SP,SU

Prerequisite or concurrent: MATE 210.

Focus on processing-structure-properties relationships of materials, including crystal structures, electronic properties of materials, materials selection, phase diagrams, corrosion, mechanical properties of polymers, cold work and annealing of alloys and heat treatments of steels. 1 laboratory.

MATE 222. Materials Selection Life Cycle. 4 units

Term Typically Offered: W

Prerequisite: MATE 210.

Materials selection for sustainable product design. Use of material selection software and techniques to solve design problems with multiple objectives and constraints. Focus on Triple Bottom Line design including functionality, economic viability, and sustainability. Principles and tools for weighted property optimization, production cost modeling, and life cycle analysis introduced through project-based learning mode. 4 lectures.

MATE 225. Materials Laboratory II. 1 unit

Term Typically Offered: F

Prerequisite: MATE 215. Concurrent: MATE 232.

Process-structure relationships of materials. Introduction to materials characterization techniques including differential scanning calorimetry, x-ray diffraction, and metallography. Emphasis on materials engineering professional practices and written communication. 1 laboratory.

MATE 232. Materials, Ethics, and Society. 4 units

Term Typically Offered: F

Prerequisite: MATE 210.

Materials Engineering principles through the context of historical and current events. Ethics and systems thinking are integrated in the study of the impacts of materials and technology on society during the Stone Age, Bronze Age, and Iron Ages, as well as today's world. Topics include crystallography, phase diagrams, microstructures, processing techniques, and nanotechnology. 4 lectures.

MATE 235. Materials Laboratory III. 1 unit

Term Typically Offered: W

Prerequisite: MATE 225.

Mechanical property testing by tensile tests and hardness tests. Emphasis of data interpretation and analysis with structure-property relationships of materials. Continued materials engineering professional practices. 1 laboratory.

MATE 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

MATE 310. Noncrystalline Material Systems. 4 units

Term Typically Offered: SP

Prerequisite: MATE 210, MATE 340, STAT 312. Concurrent: MATE 350.

Design and synthesis of noncrystalline material systems. Synthesis, processing techniques, properties and fabrication methods of organic and inorganic polymeric materials. 3 lectures, 1 laboratory.

MATE 325. Transport Phenomena I. 1 unit

Term Typically Offered: F

Prerequisite: PHYS 132 and MATH 141.

Directed group laboratory study of energy transport. Focus on conduction and convection. 1 laboratory.

MATE 326. Transport Phenomena II. 1 unit

Term Typically Offered: W

Prerequisite: MATH 141 and ME 211.

Directed group laboratory study of fluid static and dynamic properties and behavior. Focus on non-compressible conditions. 1 laboratory.

MATE 327. Transport Phenomena III. 1 unit

Term Typically Offered: SP

Prerequisite: CHEM 124 and PHYS 133.

Introduction to radiative heat transfer and the material properties that control it. 1 laboratory.

MATE 330. Composite Materials Systems. 4 units

Term Typically Offered: F

Prerequisite: MATE 350.

Properties, design and applications of composite material systems, concentrating on polymer-matrix, ceramic-fiber composites. Materials (matrices, fibers), mechanical behavior and properties, and manufacturing methods treated in detail. Laboratory practice concentrates on the mechanical testing of fiber-reinforced composite materials. 3 lectures, 1 laboratory.

MATE 340. Electronic Materials Systems. 4 units

Term Typically Offered: F

Prerequisite: MATE 210 and PHYS 133.

Design of electronic materials systems utilizing the basic concepts in electron theory of solids, electrical properties and conduction in materials, magnetic phenomena and optical properties in materials. 3 lectures, 1 laboratory.

MATE 350. Structural Materials Systems. 4 units

Term Typically Offered: SP

Prerequisite: MATE 360. Corequisite: CE 204. Concurrent: MATE 310.

Design of structural materials systems. Topics include stress, strain, elasticity, anelasticity, plasticity, fracture and fatigue. 3 lectures, 1 laboratory.

MATE 359. Living in a Material World. 4 units

GE Area F

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing and completion of one course from GE Area B.

Evolution of materials (ceramics, metals, polymers, composites, semiconductors) in the context of history. Traces the link between historical and technological developments enabled by materials from the Stone Age to the Electronic Age. 4 lectures. Crosslisted as HIST/MATE 359. Fulfills GE Area F.

MATE 360. Metallurgical Materials Systems. 4 units

Term Typically Offered: SP

Prerequisite: MATE 232 and MATE 235.

Physical metallurgy of engineering alloys including ferrous (steel) and nonferrous (aluminum, copper) systems. Connection to phase diagrams, microstructural development and phase transformations, physical and mechanical properties, precipitation hardening, cold work and annealing treated in detail. Laboratory focuses on microstructure development in steels and aluminum alloy casting. 3 lectures, 1 laboratory.

MATE 370. Kinetics of Materials and Process Design. 4 units

Term Typically Offered: F

Prerequisite: MATE 360 and MATE 380.

Design of processes for engineering materials. Topics include kinetics in materials: solid-state diffusion (steady-state and non-steady-state), nucleation and growth kinetics, solid state phase transformations. 3 lectures, 1 laboratory.

MATE 380. Thermodynamics and Physical Chemistry. 4 units

Term Typically Offered: W

Prerequisite: CHEM 125, PHYS 133, MATH 143, MATE 210 and MATE 215; Materials Engineering students only.

Thermodynamics concepts related to materials engineering systems and processes: process flowsheets, mass and energy balances, Ellingham diagrams. Physical chemistry concepts related to materials engineering: ideal gases, systems and surroundings, first through third laws of thermodynamics, phase equilibria, chemical reactions. 4 lectures.

MATE 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

MATE 401. Materials Characterization Techniques. 4 units

Term Typically Offered: F, W

Prerequisite: MATE 210 and MATE 215.

Hands-on experience with materials characterization instruments, such as scanning electron microscopy (SEM), light optical microscopy, x-ray diffraction (XRD), and atomic force microscopy (AFM). Open-ended projects to develop expertise with trouble-shooting ability, and the process of materials characterization and analysis 2 lectures, 2 laboratories.

MATE 410. Nanoscale Engineering. 3 units

Term Typically Offered: F, W, SP

Prerequisite: CHEM 125, PHYS 133 and MATE 210.

Material properties (mechanics, electronics, heat transfer, photonics, fluid mechanics and biomechanics) at the nanometer scale. Evaluation of nano-scale systems designed from a bottoms-up approach with unique properties. Exploration of integration of biology, chemistry, physics and engineering. 3 lectures.

MATE 420. Biopolymers and Bionanocomposites. 4 units

Term Typically Offered: F, W, SP

Prerequisite: MATE 310 or CHEM 444.

Exploration of the synthesis, processing, properties, and performance of biologically derived polymers. Examination of nano-scale reinforcements and their use to enhance performance of biopolymers. Emphasis on reading and interpreting contemporary scientific literature. 4 lectures.

MATE 425. Corrosion Engineering. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CHEM 125 or CHEM 128, MATE 210, MATE 215.

Forms of corrosion. Influences of environmental variables on corrosion. Methods of corrosion control. 3 lectures, 1 laboratory.

MATE 430. Micro/Nano Fabrication. 3 units

Term Typically Offered: W

Prerequisite: BMED 212 or MATE 210.

Fabrication science and technology for creating micro and nano scale devices. Explore basic processes such as oxidation, diffusion, ion implantation, etching, chemical and physical vapor deposition, photolithography. Develop an understanding of the science of each process and how to select the right steps for fabricating electronic, photon and micro-electro-mechanical systems devices. 3 lectures. Crosslisted as BMED 434/EE 423/MATE 430.

MATE 435. Microfabrication Laboratory. 1 unit

Term Typically Offered: W

Corequisite: BMED 434/EE 423/MATE 430.

Application of basic processes involved in microfabrication: cleanroom protocol, oxidation, diffusion, photolithography etching and sputtering. Explore process development through fabrication of electronic, photonic or microfluidic devices. Each student will be part of a team that will fabricate and test a device. 1 laboratory. Crosslisted as BMED/MATE 435.

MATE 440. Welding Metallurgy and Joining of Advanced Materials. 3 units

Term Typically Offered: W, SP

Prerequisite: MATE 210.

Principles, primary variables, and microstructural changes associated with the joining process. Physics of energy transfer. Heat and mass balances in joining, thermodynamic and kinetic justification of solidification and near interface microstructures. Heterogeneous interfaces, adhesion, wetting. Relation between process selection, interface design, microstructure, and properties, weldability. 3 lectures.

MATE 445. Joining of Advanced Materials Laboratory. 2 units

Term Typically Offered: W, SP

Prerequisite: MATE 210. Corequisite: MATE 440.

Laboratory to accompany MATE 440. Illustration of principles, primary variables, and microstructural changes associated with the joining process. Physics of energy transfer. Heat and mass balances in joining, thermodynamic and kinetic justification of solidification and near interface micro-structures. Heterogeneous interfaces, adhesion, wetting. Relation between process selection, interface design, microstructure, and properties, weldability. 2 laboratories.

MATE 446. Surface Chemistry of Materials. 3 units

Term Typically Offered: SP

Prerequisite: CHEM 125 or CHEM 128; CHEM 351, MATE 380, or ME 302.

Surface energy. Capillarity, solid and liquid interface, adsorption. Surface areas of solids. Contact angles and wetting. Friction, lubrication and adhesion. Relationship of surface to bulk properties of materials. Applications. 3 lectures. Crosslisted as CHEM/MATE 446.

MATE 450. Fracture and Failure Analysis. 4 units

Term Typically Offered: F, W, SP

Prerequisite: MATE 210, MATE 215, MATE 350; and Senior standing.

Fracture processes and fracture mechanics of structural materials concentrating on engineering alloys. Topics include fracture of alloys, fracture mechanics (Griffith analysis, Linear Elastic Fracture Mechanics), and fatigue. Laboratory focuses on fracture surface analysis, failure analysis, and mechanical testing. 3 lectures, 1 laboratory.

MATE 458. Microelectronics and Electronics Packaging. 4 units

Term Typically Offered: F, W, SP

Prerequisite: EE 112 or EE 201. Recommended: MATE 210.

Materials, processes, and reliability of microelectronics and electronics packaging, surface mount assembly and printed circuit board fabrication. Organic substrates and ceramic substrates. Mechanical design, thermal, and electrical considerations in electronic packaging. Design for manufacturability. Overview of optoelectronics packaging and other emerging technologies in microelectronics and electronic packaging. Project on design and manufacture of an electronic device. 3 lectures, 1 laboratory. Crosslisted as CPE 488/IME 458/MATE 458.

MATE 460. Materials Selection in Mechanical Design. 4 units

Term Typically Offered: F, W, SP

Prerequisite: MATE 350.

Materials-based approach to mechanical design. Using mechanical and physical properties of materials (performance indices) to select structural materials for applications (Materials Selection Charts). Detailed background of material properties - information from materials and mechanics. Numerous case studies highlight the concepts covered. 4 lectures.

MATE 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

MATE 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

MATE 482. Senior Project I. 1 unit

Term Typically Offered: F

Prerequisite: IME 144; senior standing; and Materials Engineering major.

Foundations of senior project design. Completion of the preliminary stages of selecting a senior project, designing experiments, evaluating realistic constraints, conducting initial experiments, and managing a project timeline. 1 laboratory.

MATE 483. Senior Project II. 2 units

Term Typically Offered: W

Prerequisite: MATE 482.

Continuation of senior project. Completion of a senior project experimental component under the guidance of a faculty supervisor. Research methodology, experimental design, experimental work and data analysis. 2 laboratories.

MATE 484. Senior Project III. 2 units

Term Typically Offered: SP

Prerequisite: MATE 483.

Continuation of MATE 483. Completion of a senior project data analysis and communication under the guidance of a faculty supervisor. Mathematical modeling and technical communication. 2 laboratories.

MATE 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

MATE 500. Individual Study. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of department head, graduate advisor, or supervising faculty member.

Advanced study planned and completed under the direction of a member of department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Total credit limited to 12 units.

MATE 510. Materials Analysis. 4 units

Term Typically Offered: F, W, SP

Prerequisite: MATE 210 and graduate standing. Recommended: MATE 401.

Fundamentals of materials characterization methods and thin-film microanalytical techniques, including optical techniques, electron microscopy, X-ray techniques, and ion beam techniques. Selection of surface analysis techniques. 4 lectures.

MATE 522. Advanced Ceramics. 4 units

Term Typically Offered: F, W, SP

Prerequisite: MATE 210 and graduate standing.

Development, utilization, and control of properties in ceramic materials (inorganic-nonmetallic solids). Emphasis on application on processing to achieve structure and properties. Structure of crystalline ceramics and of glasses. Mechanical, thermal, optical, magnetic, and electrical properties. Application of ceramics in technology. Physical chemistry of ceramics. 4 lectures.

MATE 530. Biomaterials. 4 units

Term Typically Offered: W

Prerequisite: BIO 161, or BIO 213 and BMED/BRAE 213; MATE 210 and graduate standing or consent of instructor.

Structure-function relationships for materials in contact with biological systems. Interactions of materials implanted in the body. Histological and hematological considerations including foreign body responses, inflammation, carcinogenicity, thrombosis, hemolysis, immunogenic and toxic properties. Microbial interaction with material surfaces, degradation. 4 lectures. Crosslisted as BMED/MATE 530.

MATE 550. Micro Systems. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing.

Fundamentals of intelligent systems employing sensors, actuators and intelligent controls. Impact on material properties as devices shrink in the micrometer realm. Applications toward exploring nanotechnology. 4 lectures.

MATE 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

MATE 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Senior or graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

MATE 590. Solidification and Densification. 4 units

Term Typically Offered: F, W, SP

Prerequisite: MATE 210 and graduate standing.

Thermodynamics, kinetics and morphologies of solid-liquid interfaces. Heat flow in castings, crystal growth. Solidification mechanics, solute redistribution. Production, characterization and testing of metal powders. Compacting of powder. Sintering with/without liquid phase. Hot pressing, properties of sinterings as a function of processing conditions. Application of theory to the production of useful materials. 4 lectures.

MATE 599. Design Project (Thesis). 2-5 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing.

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis.

Mathematics (MATH)

MATH Courses

MATH 92. Beginning Algebra Review. 3 units

CR/NC

Term Typically Offered: TBD

Review of basic algebra skills at the beginning algebra level intended primarily to prepare students for MATH 96 (formerly MATH 104). Course open only to students who have taken the ELM examination and are not qualified for MATH 96 (formerly MATH 104). Not for baccalaureate credit. Credit/No Credit grading only. 3 lectures. Formerly MATH 100.

MATH 94. Beginning Algebra Workshop. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 92 (formerly MATH 100).

Facilitated study and discussion of the theory, problems, and applications of beginning algebra. Not for baccalaureate credit. Credit/No Credit grading only. 1 laboratory. Formerly MATH 110.

MATH 95. Stretch Precalculus Algebra I Workshop. 1 unit

CR/NC

Term Typically Offered: F, W

Prerequisite: Appropriate Math Placement Level. Concurrent: MATH 115.

Review of basic algebra skills intended primarily to prepare students for the precalculus content in MATH 115. Not for baccalaureate credit. Credit/No Credit grading only. 1 activity.

MATH 96. Intermediate Algebra. 3 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Appropriate score on the ELM examination, or credit in MATH 92 (formerly MATH 100).

Review of basic algebra skills at the intermediate algebra level intended primarily to prepare students for MATH 116. Not for baccalaureate credit. Credit/No Credit grading only. 3 lectures. Formerly MATH 104.

MATH 98. Intermediate Algebra Workshop. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 96 (formerly MATH 104).

Facilitated study and discussion of the theory, problems, and applications of intermediate algebra. Not for baccalaureate credit. Credit/No Credit grading only. 1 laboratory. Formerly MATH 114.

MATH 112. Nature of Modern Math. 4 units

GE Area B1

Term Typically Offered: W, SP

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level.

Topics from contemporary mathematics, their development, applications, and role in society. Some typical topics, to be chosen by the instructor: graph theory, critical path analysis, statistical inference, coding, game theory, and symmetry. 4 lectures. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

MATH 115. Stretch Precalculus Algebra I. 3 units

GE Area B1

Term Typically Offered: F, W

Prerequisite: Appropriate Math Placement Level. Concurrent: MATH 95.

Pre-calculus college algebra without trigonometry with built-in review of basic algebra skills necessary to be successful in pre-calculus. MATH 115 or MATH 116, and MATH 117 are equivalent to MATH 118, but are taught at a slower pace. Upon completion of MATH 115 or MATH 116, and MATH 117, a student will receive 4 units of GE credit for Area B1. Students admitted Fall 2016 or later need a grade of C- or better in one of their GE Area B1 requirements in order to fulfill GE Area B. Not open to students with credit in MATH 116, MATH 118, MATH 141, MATH 161, or MATH 221. 3 lectures.

MATH 116. Precalculus Algebra I. 3 units

GE Area B1

Term Typically Offered: F, W, SP

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or appropriate Math Placement Level.

Pre-calculus college algebra without trigonometry. Special products and factoring, exponents and radicals. Fractional and polynomial equations. Matrices, determinants, and systems of equations. Polynomial, rational, exponential, and logarithmic functions. Graphing, inequalities, absolute value, and complex numbers. MATH 115 or MATH 116, and MATH 117 are equivalent to MATH 118, but are taught at a slower pace. Upon completion of MATH 115 or MATH 116, and MATH 117, a student will receive 4 units of GE credit for Area B1. Students admitted Fall 2016 or later need a grade of C- or better in one of their GE Area B1 requirements in order to fulfill GE Area B. Not open to students with credit in MATH 115, MATH 118, MATH 141, MATH 161, or MATH 221. Credit will be granted in only one of the following courses: MATH 115, MATH 116, or MATH 118. 3 lectures.

MATH 117. Precalculus Algebra II. 3 units

GE Area B1

Term Typically Offered: F, W, SP

Prerequisite: MATH 115 with a grade of C- or better; MATH 116 with a grade of C- or better; or consent of instructor.

Pre-calculus college algebra without trigonometry. Special products and factoring, exponents and radicals. Fractional and polynomial equations. Matrices, determinants, and systems of equations. Polynomial, rational, exponential, and logarithmic functions. Graphing, inequalities, absolute value, and complex numbers. MATH 115 or MATH 116, and MATH 117 are equivalent to MATH 118, but are taught at a slower pace. Upon completion of MATH 115 or MATH 116, and MATH 117, a student will receive 4 units of GE credit for Area B1. Students admitted Fall 2016 or later need a grade of C- or better in one of their GE Area B1 requirements in order to fulfill GE Area B. Not open to students with credit in MATH 118. 3 lectures.

MATH 118. Precalculus Algebra. 4 units

GE Area B1

Term Typically Offered: F,W,SP,SU

Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination; or appropriate Math Level Placement.

Pre-calculus algebra without trigonometry. Special products and factoring, exponents and radicals. Fractional and polynomial equations. Matrices, determinants, and systems of equations. Polynomial, rational, exponential, and logarithmic functions. Graphing, inequalities, absolute value, and complex numbers. MATH 118 is equivalent to MATH 115 or MATH 116, and MATH 117. Not open to students with credit in MATH 117, MATH 141, MATH 161, or MATH 221. Credit will be granted in only one of the following courses: MATH 115, MATH 116, or MATH 118. 4 lectures. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

MATH 119. Precalculus Trigonometry. 4 units

GE Area B1

Term Typically Offered: F, W, SP

Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 117; or MATH 118.

Rectangular and polar coordinates. Trigonometric functions, fundamental identities. Inverse trigonometric functions and relations. Vectors, complex numbers, conic sections, and analytic geometry. Not open to students with credit in MATH 141, MATH 161, or MATH 221. 4 lectures. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

MATH 126. Pre-Calculus Algebra Workshop I. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 116.

Facilitated study and discussion of the theory, problems, and applications of precalculus algebra. Credit/No Credit grading only. 1 laboratory.

MATH 127. Pre-Calculus Algebra Workshop II. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 117.

Facilitated study and discussion of the theory, problems, and applications of pre-calculus algebra. Credit/No Credit grading only. 1 laboratory.

MATH 128. Pre-Calculus Algebra Workshop. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 118.

Facilitated study and discussion of the theory, problems, and applications of pre-calculus algebra. Credit/No Credit grading only. 1 laboratory.

MATH 129. Precalculus Trigonometry Workshop. 1 unit

CR/NC

Term Typically Offered: TBD

Corequisite: Concurrent enrollment in the associated section of MATH 119.

Facilitated study and discussion of the theory, problems, and applications of pre-calculus trigonometry. Credit/No Credit grading only. 1 laboratory.

MATH 141. Calculus I. 4 units

GE Area B1

Term Typically Offered: F,W,SP,SU

Prerequisite: Completion of ELM requirement and passing score on Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 118 and high school trigonometry; or MATH 119.

Limits, continuity, differentiation. Introduction to integration. 4 lectures. Crosslisted as HNRS/MATH 141. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

MATH 142. Calculus II. 4 units

GE Area B1

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 141 with a grade of C- or better or consent of instructor.

Techniques of integration, applications to physics, transcendental functions. 4 lectures. Crosslisted as HNRS/MATH 142. Fulfills GE B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE B1 course is required to fulfill GE Area B.

MATH 143. Calculus III. 4 units

GE Area B1

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 142 with a grade of C- or better or consent of instructor.

Infinite sequences and series, vector algebra, curves. 4 lectures. Crosslisted as HNRS/MATH 143. Fulfills GE B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE B1 course is required to fulfill GE Area B.

MATH 151. Calculus Workshop I. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 141.

Facilitated study and discussion of the theory, problems, and applications of calculus. Credit/No Credit grading only. 1 laboratory.

MATH 152. Calculus Workshop II. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 142.

Facilitated study and discussion of the theory, problems, and applications of calculus. Credit/No Credit grading only. 1 laboratory.

MATH 153. Calculus Workshop III. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 143.

Facilitated study and discussion of the theory, problems, and applications of calculus. Credit/No Credit grading only. 1 laboratory.

MATH 161. Calculus for the Life Sciences I. 4 units

GE Area B1

Term Typically Offered: W, SP, SU

Prerequisite: Completion of ELM requirement and passing score on Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 118.

Review of exponential, logarithmic, and trigonometric functions. Differential and integral calculus with applications to the biological sciences. Introduction to differential equations and mathematical modeling. Examples, exercises and applications to emphasize problems in life sciences. Not open to students with credit in MATH 141. 4 lectures. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

MATH 162. Calculus for the Life Sciences II. 4 units

GE Area B1

Term Typically Offered: F, SP, SU

Prerequisite: MATH 161.

Review of exponential, logarithmic, and trigonometric functions. Differential and integral calculus with applications to the biological sciences. Introduction to differential equations and mathematical modeling. Examples, exercises and applications to emphasize problems in life sciences. Not open to students with credit in MATH 142. 4 lectures. Fulfills GE B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE B1 course is required to fulfill GE Area B.

MATH 171. Calculus for the Life Sciences Workshop I. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 161.

Facilitated study and discussion of the theory, problems, and applications of calculus for the life sciences. Credit/No Credit grading only. 1 laboratory.

MATH 172. Calculus for the Life Sciences Workshop II. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 162.

Facilitated study and discussion of the theory, problems, and applications of calculus for the life sciences. Credit/No Credit grading only. 1 laboratory.

MATH 182. Calculus for Architecture and Construction Management. 4 units

GE Area B1

Term Typically Offered: W, SP

Prerequisite: MATH 141.

Integral calculus with applications to architecture and construction management. The algebra of vectors. Polar, cylindrical, and spherical coordinate systems. Not open to students with credit in MATH 142. 4 lectures. Fulfills GE B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE B1 course is required to fulfill GE Area B.

MATH 192. Calculus for Architecture and Construction Management Workshop. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 182.

Facilitated study and discussion of the theory, problems, and applications of calculus to architecture and construction management. Credit/No Credit grading only. 1 laboratory.

MATH 202. Orientation to Mathematics Major. 1 unit

CR/NC

Term Typically Offered: F, SP

Prerequisite: MATH 143.

Career opportunities in the field of mathematics, preparing a field of study, and a survey of departmental facilities and procedures related to research, study and graduation. Credit/No Credit grading only. 1 lecture.

MATH 206. Linear Algebra I. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 143.

Systems of linear equations. Matrix algebra, including inverses and determinants. Vectors, vector spaces, bases and linear transformations in real coordinate space of n dimensions. Eigenvalues, eigenvectors and diagonalization. Applications of linear algebra. Introduction to inner products and orthogonality. 4 lectures.

MATH 221. Calculus for Business and Economics. 4 units

GE Area B1

Term Typically Offered: W, SP

Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 118.

Polynomial calculus for optimization and marginal analysis, and elementary integration. Not open to students with credit in MATH 142. 4 lectures. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

MATH 227. Mathematics for Elementary Teaching I. 4 units

GE Area B1

Term Typically Offered: F, W

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level.

Introduction to problem solving, set theory, number systems, arithmetic operations, models, and number theory. This class is designed for Liberal Studies majors. Other students will be admitted only by consent of instructor. 4 lectures. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

MATH 231. Calculus for Business and Economics Workshop. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 221.

Facilitated study and discussion of the theory, problems, and applications of business calculus. Credit/No Credit grading only. 1 laboratory.

MATH 241. Calculus IV. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 143.

Partial derivatives, multiple integrals, introduction to vector analysis. 4 lectures. Crosslisted as HNRS/MATH 241.

MATH 242. Differential Equations I. 4 units

Term Typically Offered: W, SP

Prerequisite: MATH 206 and MATH 241.

Ordinary differential equations: first-order linear equations, separable equations, exact equations, second-order linear equations, nonhomogeneous equations, systems of first-order linear equations, systems of nonlinear equations, modeling and applications. Not open to students with credit in MATH 244. 4 lectures.

MATH 244. Linear Analysis I. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 143.

Separable and linear ordinary differential equations with selected applications; numerical and analytical solutions. Linear algebra: vectors in n -space, matrices, linear transformations, eigenvalues, eigenvectors, diagonalization; applications to the study of systems of linear differential equations. 4 lectures. Crosslisted as HNRS/MATH 244.

MATH 248. Methods of Proof in Mathematics. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 143.

Methods of proof (direct, contradiction, conditional, contraposition); valid and invalid arguments. Examples from set theory. Quantified statements and their negations. Functions, indexed sets, set functions. Proofs in number theory, algebra, geometry and analysis. Proof by induction. Equivalence and well-defined operations and functions. The axiomatic method. 4 lectures.

MATH 251. Calculus Workshop IV. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 241.

Facilitated study and discussion of the theory, problems, and applications of calculus. Credit/No Credit grading only. 1 laboratory.

MATH 254. Linear Analysis Workshop I. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 244.

Facilitated study and discussion of the theory, problems, and applications of linear analysis. Credit/No Credit grading only. 1 laboratory.

MATH 258. Methods of Proof in Mathematics Workshop. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 248.

Facilitated study and discussion of the methods and techniques of proof in mathematics. Credit/No Credit grading only. 1 laboratory.

MATH 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

MATH 300. Technology in Mathematics Education. 4 units

Term Typically Offered: F

Prerequisite: MATH 248.

Examination of existing hardware and software designed for educational uses. Discussion of mathematical topics appropriate for computer enhancement. Special methods and techniques for educational uses of computers. Emphasis on activity learning and applications. Computer as a classroom management device. 4 lectures.

MATH 304. Vector Analysis. 4 units

GE Area B6

Term Typically Offered: W, SP

Prerequisite: MATH 206 or MATH 244, and MATH 241.

Differential and integral calculus of vector-valued functions. Green's Theorem, Stokes' Theorem, and the Divergence Theorem. Applications and generalizations. 4 lectures. Fulfills GE B6.

MATH 306. Linear Algebra II. 4 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 206 or MATH 244; MATH 241; and a C- or better in MATH 248, or consent of instructor.

Rigorous development of real and complex vector spaces, including infinite dimensional spaces. Subspaces, bases, products and direct sums. Examples and properties of linear transformations. Similarity, eigenvalues, eigenvectors and diagonalization. Characteristic and minimal polynomials, Cayley-Hamilton Theorem. 4 lectures.

MATH 316. Introduction to Linear Algebra Workshop II. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 306.

Facilitated study and discussion of the methods and techniques of proof in linear algebra. Credit/No Credit grading only. 1 laboratory.

MATH 328. Mathematics for Elementary Teaching II. 4 units

Term Typically Offered: W, SP

Prerequisite: MATH 227 with a grade of C- or better or consent of instructor.

Introduction to rational and real numbers, probability and counting techniques, statistics, and geometry. Computer applications. 4 lectures.

MATH 329. Mathematics for Elementary Teaching III. 4 units

Term Typically Offered: F, SP

Prerequisite: MATH 328.

Introduction to rational and real numbers, probability and counting techniques, statistics, and geometry. Computer applications. 4 lectures.

MATH 330. Algebraic Thinking with Technology. 4 units

Term Typically Offered: F, W

Prerequisite: MATH 329.

Algebraic concepts for elementary teachers. Mathematical patterns, equations and inequalities, linear and quadratic functions, exponential and logarithmic functions, systems of equations, roots of polynomials, factoring of polynomials, and right-triangle trigonometry. Computer applications. 4 lectures.

MATH 335. Graph Theory. 4 units

Term Typically Offered: F

Prerequisite: MATH 248 or junior standing.

Introduction to graph theory and its applications: isomorphism, paths and searching, connectedness, trees, tournaments, planarity, graph colorings, matching theory, network flow, adjacency and incidence matrices. Further topics to be selected from the theory of finite state machines, Ramsey theory, extremal theory, and graphical enumeration. 4 lectures.

MATH 336. Combinatorial Math. 4 units

Term Typically Offered: F, W

Prerequisite: MATH 248 or junior standing.

Methods of enumerative combinatorics: sum, product, and division rules, bijective and recursive techniques, inclusion and exclusion, generating functions, and the finite difference calculus. Advanced topics to be selected from the theory of partitions, Polya theory, designs, and codes. 4 lectures.

MATH 341. Theory of Numbers. 4 units

Term Typically Offered: F, SP

Prerequisite: MATH 248 with a grade of C- or better or consent of instructor.

Properties of numbers. Euclid's Algorithm, greatest common divisors, diophantine equations, prime numbers, congruences, number theoretic functions, the quadratic reciprocity laws, primitive roots and indices. 4 lectures.

MATH 344. Linear Analysis II. 4 units

GE Area B6

Term Typically Offered: F, W, SP

Prerequisite: MATH 206 and MATH 242, or MATH 241 and MATH 244.

Linear methods applied to the solution of differential equations. Laplace transforms. Series solutions to ordinary differential equations. Orthogonality in n -space, Gram-Schmidt orthogonalization and least squares methods. Orthogonal bases in function spaces, Sturm-Liouville theory. Fourier series and transforms. Special functions of applied mathematics. 4 lectures. Fulfills GE B6.

MATH 350. Mathematical Software. 4 units

Term Typically Offered: SP

Prerequisite: MATH 206 or MATH 244, and MATH 241, and an introductory college-level programming course, or consent of instructor.

Problem-solving using mathematical software. 4 lectures.

MATH 351. Typesetting with LaTeX. 1 unit

CR/NC

Term Typically Offered: W

Prerequisite: Junior standing.

Preparing documents, especially mathematical ones, using LaTeX and AMS-LaTeX. Credit/No Credit grading only. 1 lecture.

MATH 370. Putnam Exam Seminar. 2 units

Term Typically Offered: F

Prerequisite: Consent of instructor.

Directed group study of mathematical problem solving techniques. Open to undergraduate students only. Class members are expected to participate in the annual William Lowell Putnam Mathematical Competition. Course may be repeated up to eight units. 2 seminars.

MATH 371. Math Modeling Seminar. 2 units

Term Typically Offered: W

Prerequisite: Consent of instructor.

Directed group study of mathematical modeling techniques. Open to undergraduate students only. Class members are expected to participate in the annual Mathematical Competition in Modeling. Total credit limited to 8 units. 2 seminars.

MATH 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing and consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units.

MATH 404. Introduction to Differential Geometry. 4 units

Term Typically Offered: F

Prerequisite: MATH 304.

Theory of curves and surfaces in space. Topics such as Frenet formulas, curvature, geodesics, Cartan structural equations, Gauss-Bonnet Theorem. 4 lectures.

MATH 406. Linear Algebra III. 4 units

Term Typically Offered: SP

Prerequisite: MATH 306.

Rigorous development of real and complex inner product spaces. Orthogonal bases and direct sums of subspaces. Linear transformations on inner product spaces. Properties of self-adjoint and normal operators. Additional topics such as the Jordan Decomposition Theorem and the Spectral Theorem. 4 lectures.

MATH 408. Complex Analysis I. 4 units

GE Area B6

Term Typically Offered: F

Prerequisite: MATH 242, or MATH 241 and MATH 244.

Elementary analytic functions and mappings. Cauchy's Integral Theorem; Poisson's Integral Formula. Taylor and Laurent series, theory of residues, and the evaluation of integrals. Harmonic functions, conformal mappings. 4 lectures. Fulfills GE B6.

MATH 409. Complex Analysis II. 4 units

Term Typically Offered: W

Prerequisite: MATH 408.

Elementary analytic functions and mappings. Cauchy's Integral Theorem; Poisson's Integral Formula. Taylor and Laurent series, theory of residues, and the evaluation of integrals. Harmonic functions, conformal mappings. 4 lectures.

MATH 412. Introduction to Analysis I. 4 units

Term Typically Offered: F, W

Prerequisite: MATH 306.

Introduction to concepts and methods basic to real analysis. Topics such as the real number system, sequences, continuity, uniform continuity and differentiation. 4 lectures.

MATH 413. Introduction to Analysis II. 4 units

Term Typically Offered: W

Prerequisite: MATH 412.

A continuation of Introduction to Analysis I covering such topics as integration, infinite series, uniform convergence and functions of several variables. 4 lectures.

MATH 414. Introduction to Analysis III. 4 units

Term Typically Offered: SP

Prerequisite: MATH 413.

Continuation of Introduction to Analysis II covering such topics as differentiation and integration of functions of several variables and other advanced topics. 4 lectures.

MATH 416. Differential Equations II. 4 units

Term Typically Offered: F, W

Prerequisite: MATH 206 and MATH 242, or MATH 241 and MATH 244.

Qualitative theory of ordinary differential equations: Existence and Uniqueness Theorem, phase portraits, limit sets, stability of fixed points and periodic orbits, energy functions, Poincare-Bendixson Theorem, Poincare maps, bifurcations, attractors, chaos. 4 lectures.

MATH 418. Partial Differential Equations. 4 units

Term Typically Offered: F, SP

Prerequisite: MATH 344. Recommended: MATH 304.

Mathematical formulation of physical laws. Separation of variables. Orthogonal functions and generalized Fourier series. Bessel functions, Legendre polynomials. Sturm-Liouville problem. Boundary value problems; nonhomogeneous techniques. Applications to heat flow, potential theory, vibrating strings and membranes. 4 lectures.

MATH 419. Introduction to the History of Mathematics. 4 units

Term Typically Offered: W

Prerequisite: MATH 248 with a grade of C- or better and at least one upper division course in mathematics, or consent of instructor.

Evolution of mathematics from earliest to modern times. Major trends in mathematical thought, the interplay of mathematical and technological innovations, and the contributions of great mathematicians. Appropriate for prospective and in-service teachers. 4 lectures.

MATH 422. Introduction to Analysis I Workshop. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 412.

Facilitated study and discussion of the methods and techniques of proof in introductory analysis. Credit/No Credit grading only. 1 laboratory.

MATH 423. Advanced Mathematics for Teaching. 4 units

Term Typically Offered: SP

Prerequisite: MATH 442 and MATH 481.

Introduction to mathematics education research and advanced exploration of the mathematics taught in California's public high schools and middle schools through problem analysis, concept analysis, and problem connections. 4 lectures.

MATH 424. Organizing and Teaching Mathematics. 4 units

CR/NC

Term Typically Offered: F

Prerequisite: Acceptance into the Mathematics Single Subject Credential Program.

Organization, selection, presentation, application and interpretation of subject matter in mathematics. Introduction to current issues in mathematics education. For students who will be teaching in secondary schools. Credit/No Credit grading only. 4 lectures.

MATH 425. Mathematics Student Teaching Seminar. 2 units

CR/NC

Term Typically Offered: W, SP

Prerequisite: Acceptance into Step II of the Single Subject Credential Program in Mathematics. Concurrent: EDUC 469 or EDUC 479.

Principles and practice in effective teaching of mathematics at the middle and high school level, learning theories, curriculum content and structure, classroom issues, and the teaching profession. Credit/No Credit grading only. Total credit limited to 4 units. 2 seminars.

MATH 435. Discrete Mathematics with Applications I. 4 units

Term Typically Offered: F

Prerequisite: MATH 248 with a grade of C- or better and MATH 336, or consent of instructor.

Methods of discrete mathematics with applications. Generating functions and Lagrange inversion, partition theory, permutation statistics and q-analogues, posets and Moebius inversion. Additional topics including lattice paths and basic hypergeometric series. 4 lectures. Not open to students with credit in MATH 530.

MATH 436. Discrete Math with Applications II. 4 units

Term Typically Offered: TBD

Prerequisite: MATH 435. Corequisite: MATH 482.

Methods of discrete mathematics with applications. Polya theory, codes, designs, matroids, the combinatorics of symmetric functions, and tableaux combinatorics. Additional topics including transversals and Latin squares, asymptotics, and discrete probability theory. 4 lectures. Not open to students with credit in MATH 531.

MATH 437. Game Theory. 4 units

Term Typically Offered: SP

Prerequisite: MATH 206 or MATH 244, and MATH 248 with a grade of C- or better, or consent of instructor.

Development of the mathematical concepts, techniques, and models used to investigate optimal strategies in competitive situations; games in extensive, normal, and characteristic form, Nash equilibrium points and Nash Bargaining Model. 4 lectures.

MATH 440. Topology I. 4 units

Term Typically Offered: W

Prerequisite: MATH 412. Corequisite: MATH 481.

Introduction to general topological spaces with emphasis on surfaces and manifolds. Open and closed sets, continuity, compactness, connectedness. Quotient spaces. 4 lectures. Not open to students with credit in MATH 540.

MATH 441. Topology II. 4 units

Term Typically Offered: TBD

Prerequisite: MATH 440.

Introduction to general topological spaces with emphasis on surfaces and manifolds. Fundamental group. Triangulations of spaces, classification of surfaces. Other topics may include covering spaces, simplicial homology, homotopy theory and topics from differential topology. 4 lectures. Not open to students with credit in MATH 541.

MATH 442. Euclidean Geometry. 4 units

Term Typically Offered: W

Prerequisite: MATH 248 with a grade of C- or better or consent of instructor. Recommended: MATH 300 or familiarity with dynamic geometry software.

Foundations of Euclidean geometry, finite geometries, congruence, similarities, polygonal regions, circles and spheres. Constructions, mensuration, the parallel postulate. Appropriate for prospective and in-service mathematics teachers. 4 lectures.

MATH 443. Modern Geometries. 4 units

Term Typically Offered: SP

Prerequisite: MATH 442.

Non-Euclidean and projective geometries. Properties of parallels, biangles, Saccheri and Lambert quadrilaterals, angle-sum and area. Limiting curves: hyperbolic trigonometry, duality, perspectivity, quadrangles, fundamental theorems of projective geometry, conics. 4 lectures.

MATH 451. Numerical Analysis I. 4 units

Term Typically Offered: W

Prerequisite: MATH 206 and MATH 242, or MATH 241 and MATH 244, and an introductory college-level programming course.

Topics in interpolation and approximation methods, initial value problems, and boundary value problems of ordinary differential equations. 4 lectures.

MATH 452. Numerical Analysis II. 4 units

Term Typically Offered: SP

Prerequisite: MATH 451.

Numerical techniques for solving partial differential equations of the parabolic, hyperbolic and elliptic type. Further topics in approximation theory. 4 lectures.

MATH 453. Numerical Optimization. 4 units

Term Typically Offered: SP

Prerequisite: MATH 306 and MATH 451.

Algorithms for solving optimization problems that cannot be solved analytically. Descent algorithms including exact and practical line-searches, steepest descent method, and Newton and quasi-Newton methods for unconstrained minimization. Optimality conditions for constrained optimization, linear programming. Projection and Lagrangian methods, and interior point methods for constrained minimization. 4 lectures.

MATH 459. Senior Project Seminar. 4 units

Term Typically Offered: F, SP

Prerequisite: MATH 306, and completion of at least two additional upper-division courses in the math major.

Written and oral analyses and presentations by students on topics from advanced mathematics and mathematical modeling. Not open to students with credit in MATH 460. 4 seminars.

MATH 460. Senior Project Applied Seminar. 4 units

Term Typically Offered: F

Prerequisite: CSC/CPE 101 or MATH 350; MATH 306; and MATH 344.

Written and oral analyses and presentations by students on topics in applied mathematics, including applications to sustainability. Construction of mathematical models for physical and biological problems, with analysis and interpretation of the solutions of these models using both analytical and numerical techniques. Not open to students with credit in MATH 459. 4 seminars.

MATH 461. Senior Project I. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Senior Standing.

Selection and development of a mathematics project under faculty supervision. Minimum 60 hours total time.

MATH 462. Senior Project II. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 461.

Completion of a mathematics project under faculty supervision. Project results are presented in a formal report. Minimum 60 hours total time.

MATH 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

MATH 474. Advanced Topics in Geometry and Topology. 1 unit

Term Typically Offered: TBD

Prerequisite: MATH 248 and consent of instructor. Recommended: MATH 404 and MATH 440.

Exploration of advanced topics and problems in geometry and topology through reading, writing and oral presentations. The Schedule of Classes will list the specific topic as a subtitle. Total credit limited to 6 units. 1 seminar.

MATH 475. Advanced Topics in Mathematics. 4 units

Term Typically Offered: TBD

Prerequisite: MATH 306 and consent of instructor.

Exploration of advanced topics and problems in mathematics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

MATH 476. Advanced Topics in Applied Mathematics. 4 units

Term Typically Offered: TBD

Prerequisite: MATH 306 and consent of instructor.

Exploration of advanced topics and problems in applied mathematics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

MATH 481. Abstract Algebra I. 4 units

Term Typically Offered: F, W

Prerequisite: MATH 306 or MATH 341.

Introduction to the study of groups. Topics include groups of permutations, cyclic groups, normal subgroups and quotient groups. Homomorphisms, Lagrange's Theorem, Cayley's Theorem, the Isomorphism Theorems and the Fundamental Theorem of Finite Abelian Groups. 4 lectures.

MATH 482. Abstract Algebra II. 4 units

Term Typically Offered: W, SP

Prerequisite: MATH 481.

Introduction to rings and fields. Reducible and irreducible polynomials, ideals, prime and maximal ideals, quotient rings, ring homomorphisms, the Isomorphism Theorems, integral domains, unique factorization domains, principal ideal domains, Euclidean domains, fields of fractions, field extensions and finite fields. 4 lectures.

MATH 483. Abstract Algebra III. 4 units

Term Typically Offered: SP

Prerequisite: MATH 482.

Algebraic field extensions, the tower law, ruler-and-compass constructions, the primitive element theorem, algebraic and transcendental numbers, algebraic closure, the fundamental theorem of algebra, finite fields, Galois extensions and the fundamental theorem of Galois theory. Not open to students with credit in MATH 560. 4 lectures.

MATH 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 12 units. Credit/No Credit grading only.

MATH 491. Abstract Algebra I Workshop. 1 unit

CR/NC

Term Typically Offered: TBD

Concurrent: Enrollment in the associated section of MATH 481.

Facilitated study and discussion of the methods and techniques of proof in abstract algebra. Credit/No Credit grading only. 1 laboratory.

MATH 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. No major credit allowed; total credit limited to 12 units. Credit/No Credit grading only.

MATH 500. Individual Study. 1-4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of department chair.

Individual research or advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Total credit limited to 12 units.

MATH 501. Analytic Methods in Applied Mathematics. 4 units

Term Typically Offered: F

Prerequisite: MATH 344 or AERO 300, and graduate standing.

Introduction to advanced methods of mathematics useful in the analysis of engineering problems. Selected topics in perturbation theory, optimization and Fourier analysis. Not open to students in math major or master's degree program in mathematics. 4 lectures.

MATH 502. Numerical Methods in Applied Mathematics. 4 units

Term Typically Offered: W

Prerequisite: MATH 344 or AERO 300, an introductory college-level programming course, and graduate standing.

Introduction to advanced numerical analysis. Numerical techniques for solving ordinary and partial differential equations, error analysis, stability, methods for linear systems. Not open to students in math major or master's degree program in mathematics. 4 lectures.

MATH 504. Mathematical Topics for Teachers. 1-4 units

CR/NC

Term Typically Offered: SU

Prerequisite: Multiple Subject or Single Subject teaching credential.

Mathematical topics for practicing credentialed teachers. Professional growth through improvement of teachers' mathematical content knowledge and pedagogical approaches using technology, discussion, reflection, and hands-on activities. Content will vary according to teaching level. The Schedule of Classes will list topic selected. Total credit limited to 12 units. Not open to students in math major or master's degree program in mathematics. Credit/No Credit grading only. 1-4 activities.

MATH 505. Graduate Teaching Seminar. 1 unit

CR/NC

Term Typically Offered: F

Prerequisite: Graduate standing.

Principles and practice in effective teaching of college-level mathematics. Issues related to present and future teaching experiences, including time management, professionalism, student assessment, grading, classroom management, and qualities of good mathematics teachers. Reflection on individual teaching, and consideration of improvements in instruction. Credit/No Credit grading only. Total credit limited to 2 units. 1 seminar.

MATH 520. Applied Analysis I. 4 units

Term Typically Offered: W

Prerequisite: MATH 408, MATH 412 and graduate standing.

Recommended: MATH 418.

Advanced mathematical methods of analysis in science and engineering, integrated with modeling of physical phenomena. Topics include applications of complex analysis, Fourier analysis, ordinary and partial differential equations. Additional topics to be drawn from perturbation methods, asymptotic analysis, dynamical systems, numerical methods, optimization, and the calculus of variations. 4 lectures.

MATH 521. Applied Analysis II. 4 units

Term Typically Offered: SP

Prerequisite: MATH 520.

Advanced mathematical methods of analysis in science and engineering, integrated with modeling of physical phenomena. Topics include applications of complex analysis, Fourier analysis, ordinary and partial differential equations. Additional topics to be drawn from perturbation methods, asymptotic analysis, dynamical systems, numerical methods, optimization, and the calculus of variations. 4 lectures.

MATH 530. Discrete Mathematics with Applications I. 4 units

Term Typically Offered: F

Prerequisite: MATH 248 with a grade of C- or better and MATH 336 and graduate standing, or consent of instructor.

Methods of discrete mathematics with applications. Generating functions and Lagrange inversion, partition theory, permutation statistics and q-analogues, posets and Möbius inversion. Additional topics including lattice paths and basic hypergeometric series. 4 lectures. Not open to students with credit in MATH 435.

MATH 531. Discrete Mathematics with Applications II. 4 units

Term Typically Offered: W

Prerequisite: MATH 435 or MATH 530. Corequisite: MATH 482 or graduate standing in Mathematics.

Methods of discrete mathematics with applications. Polya theory, codes, designs, matroids, the combinatorics of symmetric functions, and tableaux combinatorics. Additional topics including transversals and Latin squares, asymptotics, and discrete probability theory. 4 lectures. Not open to students with credit in MATH 436.

MATH 540. Topology I. 4 units

Term Typically Offered: W

Prerequisite: MATH 412 or graduate standing in Mathematics.

Corequisite: MATH 481 or graduate standing in Mathematics.

Introduction to general topological spaces with emphasis on surfaces and manifolds. Open and closed sets, continuity, compactness, connectedness. Quotient spaces. 4 lectures. Not open to students with credit in MATH 440.

MATH 541. Topology II. 4 units

Term Typically Offered: SP

Prerequisite: MATH 440 or MATH 540.

Introduction to general topological spaces with emphasis on surfaces and manifolds. Fundamental group. Triangulations of spaces, classification of surfaces. Other topics may include covering spaces, simplicial homology, homotopy theory and topics from differential topology. 4 lectures. Not open to students with credit in MATH 441.

MATH 550. Real Analysis. 4 units

Term Typically Offered: F

Prerequisite: Satisfactory completion of the Graduate Written Examination in Analysis or consent of the Graduate Committee.

Introduction to Lebesgue measure and integration, convergence theorems, L_p spaces, Radon-Nikodym Theorem and Fubini's Theorem. 4 lectures.

MATH 560. Field Theory. 4 units

Term Typically Offered: SP

Prerequisite: MATH 482 or graduate standing.

Polynomial rings, field extensions, normal and separable extensions, automorphisms of fields, fundamental theorem of Galois theory, and further topics such as solvable groups, solution by radicals, insolubility of the quintic. Not open to students with credit in MATH 483. 4 lectures.

MATH 561. Graduate Algebra. 4 units

Term Typically Offered: F

Prerequisite: MATH 483 or MATH 560, and completion of the Graduate Written Exam in Algebra or consent of the Graduate Committee.

An introduction to advanced topics from modern algebra, including group actions, the Sylow theorems, semi-direct products and modules over a principal ideal domain. Other topics may include commutative algebra, advanced Galois theory, homological algebra, and topics from advanced linear algebra. 4 lectures.

MATH 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

MATH 580. Seminar. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing and consent of instructor.

Built around topics in advanced mathematics chosen according to the common interests and needs of the students enrolled. Each seminar will have a subtitle according to the nature of the content. Total credit limited to 12 units. 1-4 seminars.

MATH 599. Thesis. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Serious research endeavor devoted to the development, pedagogy or learning of mathematics. Course to be taken twice for a total of 6 units.

Mechanical Engineering (ME)

ME Courses

ME 128. Introduction to Mechanical Engineering I. 1 unit

Term Typically Offered: F

Prerequisite: Mechanical Engineering student; first quarter of freshman year.

Introduction to mechanical engineering and its application in professional practice. Includes design, analysis, testing and dissection of mechanical engineering systems, from simple machines to more complicated systems. Introduction to engineering graphic communication. Introduction to HVAC, Manufacturing and Mechatronics concentrations. Includes first quarter cornerstone service learning project. 1 laboratory. Formerly ME 134.

ME 129. Introduction to Mechanical Engineering II. 1 unit

Term Typically Offered: W

Prerequisite: ME 128; Mechanical Engineering student; second quarter of freshman year. Concurrent: ME 163.

Communication of designs for manufacturing using basic definitions of points, lines and planes in space. Pictorials, orthographic projection, section views and auxiliary views. Techniques from geometry and spatial definitions integrated to provide information to both the design and manufacturing processes. 1 laboratory.

ME 130. Introduction to Mechanical Engineering III. 1 unit

Term Typically Offered: SP

Prerequisite: ME 129; Mechanical Engineering student; third quarter of freshman year.

Use of computer-aided design to communicate parts and assemblies. Dimensioned drawings for part fabrication. Introduction to fits and tolerances. Layout drawings and functional assemblies. 1 laboratory.

ME 163. Freshmen Orientation to Mechanical Engineering. 1 unit

Term Typically Offered: F

Concurrent: ME 129.

Introduction to career opportunities in Mechanical Engineering, exploration of the ethical responsibilities of being a student and professional engineer, and familiarization with the Mechanical Engineering curriculum including cooperative education and international exchange opportunities. Conclusion of cornerstone service learning project. Field trip may be required. 1 activity.

ME 211. Engineering Statics. 3 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 241 (or concurrently), PHYS 131 or PHYS 141.

Analysis of forces on engineering structures in equilibrium. Properties of forces, moments, couples, and resultants. Equilibrium conditions, friction, centroids, area moments of inertia. Introduction to mathematical modeling and problem solving. Vector mathematics where appropriate. 3 lectures. Crosslisted as HNRS/ME 211.

ME 212. Engineering Dynamics. 3 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 241; ME 211 or ARCE 211.

Analysis of motions of particles and rigid bodies encountered in engineering. Velocity, acceleration, relative motion, work, energy, impulse, and momentum. Further development of mathematical modeling and problem solving. Vector mathematics where appropriate. 3 lectures. Crosslisted as HNRS 214/ME 212.

ME 228. Engineering Design Communication. 2 units

Term Typically Offered: F, W, SP

Use of engineering communication principles to communicate details of project designs including: sketching, orthographic projection, section and auxiliary views, dimensioning, and tolerances. Hand and computer based methods explored. Introduction to design for manufacturability. 2 laboratories.

ME 229. Introduction to Mechanical Engineering for Transfers. 2 units

Term Typically Offered: F, W, SP

Introduction to Mechanical Engineering and its application in professional practice. Includes design, analysis, testing and dissection of mechanical engineering systems. Investigation of personal and professional ethics. Familiarization with the ME curriculum including cooperative education and international exchange opportunities. 1 lecture, 1 laboratory.

ME 234. Philosophy of Design. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing.

General approach to the meaning of engineering design. Conceptual blocks, creativity, design process, design considerations and elements. 3 lectures.

ME 236. Measurement and Engineering Data Analysis. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Engineering majors. Recommended: CHEM 125, ENGL 149, and PHYS 132.

Introduction to principles and practice of measurement. Application of probability distributions, sampling, confidence intervals, uncertainty, and regression analysis to engineering experiments and design. Techniques for measuring common physical quantities such as temperature, pressure, and strain. Introduction to laboratory report writing and communication of technical data. 2 lectures, 1 laboratory.

ME 251. Introduction to Detailed Design with Solid Modeling. 2 units

Term Typically Offered: F, W, SP

Prerequisite: ME 130 or ME 228. Recommended: IME 143.

Part and system or assembly design with solid modeling using current software and hardware. Techniques of advanced communication including weld symbols, threaded fasteners, dimensioning and tolerancing. Creation of design layouts and part models with varied configurations and dynamic assembly models. Introduction to section mass and inertia properties. Emphasis of group work and peer review in the production of parts for assemblies. 1 lecture, 1 laboratory.

ME 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

ME 271. Selected Laboratory. 1-2 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 4 units. 1 to 2 laboratories.

ME 302. Thermodynamics I. 3 units

Term Typically Offered: F, W, SP

Prerequisite: ME 212 and PHYS 132.

Properties of working fluids and fundamental relations for processes involving the transfer of energy. First and second laws of thermodynamics, irreversibility and availability. 3 lectures.

ME 303. Thermodynamics II. 3 units

Term Typically Offered: F, W, SP

Prerequisite: ME 302.

Vapor and gas power cycles, refrigeration cycles, thermodynamic relations, psychrometrics, and chemical reactions. 3 lectures.

ME 305. Introduction to Mechatronics. 4 units

Term Typically Offered: F, W

Prerequisite: EE 321 and EE 361.

Introduction to microcontrollers and assembly language programming. Emphasis on components and techniques for interfacing that are typical of embedded microcontroller applications (A/D conversion, D/A conversion, interrupts, timers, and pulse-width modulation). Laboratory exercises involve real-time interfacing of microcontrollers to external mechanical and/or electromechanical devices. 3 lectures, 1 laboratory.

ME 318. Mechanical Vibrations. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ME 326, MATH 344. Recommended: EE 201.

Free and forced vibration response of single and multiple degree of freedom systems. Experimental studies of the dynamic behavior of structures and machines. Instrumentation methods utilized in field and laboratory. 3 lectures, 1 laboratory.

ME 320. Consumer Energy Guide. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area B.

Interdisciplinary connection of everyday consumer decisions with energy costs, security, and global warming. Energy consumption by home appliances and automobiles. Methods to reduce the individual 'energy footprint' with renewable energy, purchasing carbon offsets, and behavioral modifications. 4 lectures. Fulfills GE Area F.

ME 323. Everything is Designed: The Invention and Evolution of Products. 4 units

GE Area F

Term Typically Offered: W

Prerequisite: Junior standing and completion of GE Area B.

Investigation of engineering product designs, including social, environmental, and technological influences. Incorporation of engineering design tools to develop a product using creative methods and design methodology. Exploration of creative problem solving methods and barriers to creativity. 4 lectures. Fulfills GE Area F.

ME 326. Intermediate Dynamics. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ME 212; CSC 231 or CSC 234. Corequisite: MATH 244.

Continuation of ME 212. Additional analysis of planar motion of rigid bodies with particular attention to rotating reference frames. Kinematics of linkages, three dimensional dynamics, introduction to numerical methods and dynamic simulation of mechanisms. 3 lectures, 1 activity.

ME 328. Design for Strength and Stiffness. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BMED 212 or ME 234; CE 207; CSC 231 or CSC 234; MATE 210; ME 212; and ME 251. Corequisite: IME 141 or ITP 341.

Design of machine parts by stress and deflection. Effects of fluctuating stresses and stress concentration. Design of shafts and other machine parts. Modern industrial design practice using standard components and design layout drawings. 3 lectures, 1 laboratory.

ME 329. Mechanical Systems Design. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ME 328.

Design of mechanical equipment and systems using various machine elements and components such as threaded fasteners, power screws, springs, gears, bearings, clutches, prime movers, etc. Decision modeling based on technical and economic feasibility. 3 lectures, 1 laboratory.

ME 341. Fluid Mechanics I. 3 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 242 or MATH 244; ME 212.

Fluid properties and fluid statics. Euler and Bernoulli equations. Conservation equations; dimensional analysis. Viscous pipe flow. Course may be offered in classroom-based or online format. 3 lectures.

ME 347. Fluid Mechanics II. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ME 236, ME 341, ME 302 or consent of instructor.

Conservation equations of fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, compressible flow, turbomachinery. Laboratory measurement of turbomachine performance, velocity profiles, boundary layers on surfaces. 3 lectures, 1 laboratory.

ME 350. Heat Transfer. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CPE/CSC 101 or CSC 231 or CSC 234; MATE 360 and MATE 380, or ME 236 and ME 302 and ME 341.

Basic principles of heat transfer by conduction and convection. Laboratory experiments to characterize thermodynamic material properties, energy conversion processes, thermodynamic cycles, and performance of heat transfer equipment. Not open to students with credit in ME 343. 3 lectures, 1 laboratory.

ME 359. Fundamentals of HVAC Systems. 4 units

Term Typically Offered: W

Prerequisite: ME 302.

Fundamentals of heating, ventilating and air-conditioning (HVAC) systems, human comfort and indoor air quality, primary and secondary systems and components. 3 lectures, 1 laboratory.

ME 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units.

ME 401. Stress Analysis. 4 units

Term Typically Offered: F

Prerequisite: CE 207, MATH 344, ME 328 or consent of instructor.

Advanced strength of materials: behavior of disks, plates, and shells. Theory of elasticity. Energy methods. 3 lectures, 1 laboratory.

ME 402. Orthopedic Biomechanics. 4 units

Term Typically Offered: SP

Prerequisite: ME 328.

Biomechanical analysis of the musculoskeletal system. Emphasis on the use of statics, dynamics, strength of materials, viscoelasticity, and poroelasticity to analyze the mechanical loads acting on human joints, the mechanical properties of tissues, and the design of artificial joints. 3 lectures, 1 laboratory.

ME 404. Applied Finite Element Analysis. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BMED 410 and CE 207; or CE 406; or ME 328.

Finite element based solutions to engineering problems with an emphasis on elastostatic problems in structural mechanics. The power and pitfalls associated with the finite element method highlighted through practical modeling assignments. Introduces the use of commercial finite element codes. 3 lectures, 1 laboratory. Crosslisted as BMED/CE/ME 404.

ME 405. Mechatronics. 4 units

Term Typically Offered: W, SP

Prerequisite: ME 305 and ME 329 (may be taken concurrently); or CPE/EE 329.

Microprocessor applications in machine control and product design. Applied electronics. Drive technology; transducers and electromechanical systems. Real-time programming. Mechatronic design methodology. 3 lectures, 1 laboratory.

ME 409. Interdisciplinary Study in Biomechanics. 4 units

Term Typically Offered: TBD

Prerequisite: KINE 403; or ME 326.

Examination of human motion biomechanics. Experimental and analytical methods in motion analysis based on rigid body dynamics. Protocols for protection of human subjects in research. Hypothesis-driven research in interdisciplinary teams, including written proposal development and written/oral communication of results to a scientific audience. 1 lecture, 3 activities. Crosslisted as BMED/KINE/ME 409.

ME 410. Experimental Methods in Mechanical Design I. 4 units

Term Typically Offered: SP

Prerequisite: ME 328. Recommended: ME 318.

Bonded resistance strain gages for static and dynamic measurements; rosettes, bridge circuits, lead wire effects, special gages. Data acquisition systems, and measurement of displacement, velocity, and acceleration. Photoelastic methods including birefringent coatings. Applications in mechanical design and metrology. 3 lectures, 1 laboratory.

ME 412. Composite Materials Analysis and Design. 4 units

Term Typically Offered: F, SP

Prerequisite: AERO 331 or ME 328.

Behavior of unidirectional fiber composites. Properties of short-fiber composites, and orthotropic lamina. Analysis of laminated composites. Strength and hygrothermal behavior of composite materials. Structural optimization. 3 lectures, 1 laboratory.

ME 415. Energy Conversion. 4 units

Term Typically Offered: SP

Prerequisite: ME 302.

Engineering aspects of energy sources, conversion and storage. Topics selected from fossil fuel systems, nuclear power, thermoelectric systems, thermionic converters, fuel cells, magnetohydrodynamic generators, and geothermal, tidal, wind and ocean temperature energy conversion systems. 4 lectures.

ME 416. Ground Vehicle Dynamics and Design. 4 units

Term Typically Offered: F

Prerequisite: ME 318, ME 328.

Design of ground vehicles for directional stability and control. Tire mechanics and their effects on vehicle performance. Simulation of vehicle dynamics using digital computer. Synthesis of steering mechanism and suspension system. 3 lectures, 1 laboratory.

ME 420. Thermal System Design. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ME 303; ME 347; and ME 343 or ME 350.

Radiation and combined mode heat transfer. Design of thermal systems. Engineering economics, thermal component sizing, and steady-state simulation techniques applied to the design and performance analysis of thermal systems. Not open to students with credit in ME 440. 3 lectures, 1 laboratory.

ME 422. Mechanical Control Systems. 4 units

Term Typically Offered: F, W, SP

Prerequisite: ME 318.

Modeling and control of physical systems. Design of mechanical, hydraulic and electrical systems using time response, frequency response, state space, and computer simulation. 3 lectures, 1 laboratory.

ME 423. Robotics: Fundamentals and Applications. 4 units

Term Typically Offered: SP

Prerequisite: ME 326, ME 422.

Introduction to robots and their types. Homogeneous transformations. Kinematic equations and their solutions. Motion trajectories, statics, dynamics, and control of robots. Robot programming. Actuators, sensors and vision systems. 3 lectures, 1 laboratory.

ME 428. Senior Design Project I. 2 units

Term Typically Offered: F, W, SP

Prerequisite: ME 329. Corequisite: ME 318 and ME 350.

First of three courses taken sequentially in component and system design using real-world problems. Small teams study and apply techniques of the engineering design process including problem definition, concept generation, feasibility studies and decision making. Practice of professional skills including written and oral communication, teaming, project management, societal responsibility and ethics. 2 laboratories.

ME 429. Senior Design Project II. 2 units

Term Typically Offered: F, W, SP

Prerequisite: ME 428.

Continuation of a project begun in ME 428. Activities focused on detail design, analysis and material procurement. 2 laboratories.

ME 430. Senior Design Project III. 2 units

Term Typically Offered: F, W, SP

Prerequisite: ME 429.

Completion of a project begun in ME 428 and continued in ME 429. Design verified through prototyping and testing. 2 laboratories.

ME 431. Mechanical Design Techniques. 4 units

Term Typically Offered: TBD

Prerequisite: ME 329.

Comprehensive study of various design methods and techniques. Techniques used to explore various structural concepts such as prestressing, shaping, sizing, etc. Simulation of systems using digital computer. Design criteria identification of design parameters and constraints. 3 lectures, 1 laboratory.

ME 434. Enhanced Oil Recovery. 4 units

Term Typically Offered: W

Prerequisite: ME 302, ME 347, and ME 350.

Primary, secondary, and tertiary (enhanced) oil recovery methods. Waterflooding, polymerflooding, gas injection, steam injection, in-situ combustion, chemical flooding, miscible flooding. Performance calculations and computer applications in EOR. 4 lectures.

ME 435. Drilling Engineering. 4 units

Term Typically Offered: F

Prerequisite: ME 329, ME 347.

Theory and practice of oilwell planning, drilling, well logging, and completion applied to the development of new oil and gas production, from onshore and offshore fields. 4 lectures.

ME 436. Petroleum Production Engineering. 4 units

Term Typically Offered: SP

Prerequisite: ME 329, ME 347.

Design and operation of surface and subsurface equipment required in oil production. Processes and systems involved are rod pumping, gas lifting, acidizing, hydraulic fracturing, fluid gathering and storage, separation of oil, gas, water and sediment from produced fluid. Includes equipment used in enhanced oil recovery processes. 4 lectures.

ME 437. Nuclear Energy Power Generation. 4 units

Term Typically Offered: F

Prerequisite: Junior or senior standing in the College of Engineering, ME 302, and PHYS 133.

Operation of a nuclear electric generation station; includes reactor water chemistry, material science, electric science, mechanical science, civil engineering for the nuclear power plant engineers and digital process control systems. Field trip may be required. 4 lectures.

ME 438. Nuclear Power Plant Design. 4 units

Term Typically Offered: W

Prerequisite: ME 302 and ME 341.

Principal elements of pressurized water reactor nuclear power systems; overview of reactor physics, thermodynamics, and heat transfer; includes basic reactor physics, reactor heat generation, reactor plant systems, support systems, and reactor safety. Field trip may be required. 4 lectures.

ME 439. Nuclear Power Plant Operations. 4 units

Term Typically Offered: SP

Prerequisite: ME 437 or ME 438.

Overview of mass, momentum and energy conversion related to nuclear power plants; includes coupled neutronic/thermal models to study plant operation semi-quantitatively achieving an integrated plant understanding. Content includes: Neutron power kinetics, Coupled neutronic/thermal hydraulic modeling, Quantitative transient modeling, demonstration transients. Field trip may be required. 4 lectures.

ME 440. Thermal System Design and Optimization. 4 units

Term Typically Offered: TBD

Prerequisite: ME 303; ME 347; and ME 343.

Design and optimization of thermal systems. Engineering economics, thermal component sizing, steady-state simulation, and optimization techniques applied to the design and performance analysis of thermal systems. Not open to students with credit in ME 420. 3 lectures, 1 laboratory.

ME 441. Single Track Vehicle Design. 4 units

Term Typically Offered: W

Prerequisite: ME 318, ME 329, or consent of instructor.

Design of single track vehicles, including handling characteristics, ergonomics and human power, strength and stiffness considerations, braking and suspension. Laboratory focus on designing a single track vehicle, including fabrication of a handling prototype. 3 lectures, 1 laboratory.

ME 442. Design of Machinery. 4 units

Term Typically Offered: F

Prerequisite: ME 212.

Graphical synthesis and analysis of mechanisms and machines. Analytical fundamentals for study of displacements, velocities, accelerations, and static and dynamic forces necessary for design of planar linkages and gearing systems. Creative design projects using software simulation tools. 3 lectures, 1 laboratory.

ME 443. Turbomachinery. 4 units

Term Typically Offered: SP

Prerequisite: MATH 344, ME 303, ME 347, and ME 350.

Performance characteristics of various types for liquids and for gases. Criteria for proper selection of type and main dimensions. Cavitation criteria. Gas turbine cycles and performance. Two-dimensional cascades. Axial flow turbines and compressors. Centrifugal compressors and radial-inflow turbines. 4 lectures.

ME 444. Combustion Engine Design. 4 units

Term Typically Offered: W

Prerequisite: ME 303, ME 347, and ME 350.

Application of design parameters to the various engine cycles. Aspects of the combustion processes. Emission regulation effects on engine design. Static and dynamic loading. 3 lectures, 1 laboratory.

ME 450. Solar Thermal Power Systems. 4 units

Term Typically Offered: W

Prerequisite: ME 343. Recommended: ME 415.

High and intermediate temperature systems for conversion of solar energy to mechanical power and heat. Thermal energy storage and total thermal energy system design. 3 lectures, 1 laboratory.

ME 456. HVAC Air and Water Distribution System Design. 4 units

Term Typically Offered: F

Prerequisite: ME 302, ME 347.

Air and water distribution components and systems and the design of these systems with applications to the heating, ventilating and air-conditioning (HVAC) industry. 3 lectures, 1 laboratory.

ME 457. Refrigeration Principles and Design. 4 units

Term Typically Offered: SP

Prerequisite: ME 341 and ME 350.

Basic engineering principles of refrigeration processes including: vapor compression cycles, multipressure systems, absorption systems, steam jet cooling, air cycles, and low temperature refrigeration. 3 lectures, 1 laboratory.

ME 458. Building Heating and Cooling Loads. 4 units

Term Typically Offered: F

Prerequisite: ME 303 and ME 350.

Building heating and cooling load calculations, estimating energy consumption and operating costs for heating, ventilating and air-conditioning system design and selection. 3 lectures, 1 laboratory.

ME 459. HVAC Senior Design Project I. 3 units

Term Typically Offered: W

Prerequisite: ME 456, ME 458.

First quarter of a two quarter sequence. Team project work in designing heating, ventilating and air-conditioning (HVAC) systems. New developments, policies and practices in the HVAC industry. Professional ethics relevant for practicing engineers. 1 lecture, 2 laboratories.

ME 460. HVAC Senior Design Project II. 2 units

Term Typically Offered: SP

Prerequisite: ME 459.

Continuation of work begun in ME 459. Team project designing heating, ventilating and air-conditioning (HVAC) systems. 2 laboratories.

ME 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 lectures.

ME 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

ME 488. Wind Energy Engineering. 4 units

Term Typically Offered: SP

Prerequisite: ME 329, ME 347, ME 302.

Engineering aspects of windpower systems including mechanical design, support structure design, aerodynamic analysis, wind field analysis, system concepts and analysis, and economics. 4 lectures.

ME 493. Cooperative Education Experience. 2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 6 units.

ME 494. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 18 units.

ME 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. A more fully developed formal report and evaluation by work supervisor required. Credit/No Credit grading only. No major credit allowed; total credit limited to 24 units.

ME 500. Individual Study. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head, graduate advisor and supervising faculty member.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition.

ME 501. Continuum Mechanics and Elasticity. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing.

Introduction to continuum mechanics. Kinematics, stress, and balance laws. Constitutive theory for isotropic and anisotropic solids and viscous fluids. Applications including design of beams and pressure vessels, stress concentrations, fiber-reinforced composites, and non-homogeneous biological materials. 4 lectures. Crosslisted as CE 511/ME 501.

ME 503. Inelastic Stress Analysis. 4 units

Term Typically Offered: TBD

Prerequisite: ME 501 or CE 511.

Perfectly plastic and work hardening materials; von Mises and Tresca yield, isotropic and kinematic hardening flow rules, boundary-value problems. Finite elasticity: kinematics, Cauchy- and Green-elasticity, invariance, constraints, Neo-Hookean and Mooney-Rivlin materials, experimental approaches, non-uniqueness, anisotropy, residual stress, thermoelasticity, boundary-value problems. 4 lectures. Crosslisted as CE 513/ME 503.

ME 504. Finite Element Analysis. 4 units

Term Typically Offered: SP

Prerequisite: CE/ME 404 and CE 511 or ME 501 or consent of instructor.

Linear finite element theory and analysis. Strong, weak and variational formulations. Physical and isoparametric spaces. Error estimates and numerical integration. Development of finite element algorithms. Use of commercial finite element codes to illustrate course concepts including modeling issues and limitations. 3 lectures, 1 laboratory. Crosslisted as CE/ME 504.

ME 506. System Dynamics. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor.

Unified approach for mathematical modeling and analysis of dynamic physical systems which may store energy in multiple energy domains. Emphasis on developing lumped-parameter linear system models from a set of primitive elements in a systematic manner. 4 lectures.

ME 507. Mechanical Control System Design. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Application of principles of high-level design to mechanical control system implementation. Use of modified state transition logic in conjunction with object-oriented programming as design methodology. Real-time programming using above techniques for control of mechanical systems. 3 lectures, 1 laboratory.

ME 517. Advanced Vibrations. 4 units

Term Typically Offered: SP

Prerequisite: ME 318, graduate standing or consent of instructor.

Vibration of complex engineering systems. Inertia and stiffness matrices. Natural frequencies and normal modes. Approximate solutions and computer techniques. Response to transient and periodic inputs. 3 lectures, 1 laboratory.

ME 518. Machinery Vibration and Rotor Dynamics. 4 units

Term Typically Offered: W

Prerequisite: ME 318, graduate standing or consent of instructor.

Vibrations relating to rotating machinery. Modeling of structural rotordynamic phenomena induced by shaft flexibility, bearings, and seals. Laboratory measurement of rotor system dynamic response and interpretation of machinery diagnostic information. Research project on a related topic. 3 lectures, 1 laboratory.

ME 540. Viscous Flow. 4 units

Term Typically Offered: W

Prerequisite: ME 347, MATH 344 and graduate standing or consent of instructor.

Introduction to tensor calculus and indicial notation. Development of Reynolds' Transport Theory. Special forms of the governing equations of fluid motion. Internal flows and other classical solutions to the Navier-Stokes equations. 4 lectures.

ME 541. Advanced Thermodynamics. 4 units

Term Typically Offered: TBD

Prerequisite: ME 303, ME 347, ME 350, and graduate standing.

Selected modern applications of thermodynamics which may include topics from: 1) equilibrium and kinetics as applied to combustion and air pollution, analysis and evaluation of techniques used to predict properties of gases and liquids, and 2) improvement of modern thermodynamic cycles by second law analysis. 4 lectures.

ME 542. Dynamics and Thermodynamics of Compressible Flow. 4 units

Term Typically Offered: F

Prerequisite: MATH 244, ME 303, ME 347, ME 350, and graduate standing.

Control volume analysis of fluid-thermo equations for one-dimensional, compressible flow involving area change, normal shocks, friction, and heat transfer. Two-dimensional supersonic flow including linearization, method of characteristics, and oblique shocks. One-dimensional constant area, unsteady flow, 4 lectures.

ME 552. Advanced Heat Transfer I. 4 units

Term Typically Offered: F

Prerequisite: MATH 344, ME 347, ME 350, and graduate standing.

Advanced principles of heat transfer. Classical solution techniques to problems in conduction and/or radiation. 4 lectures.

ME 553. Advanced Heat Transfer II. 4 units

Term Typically Offered: W

Prerequisite: MATH 344, ME 347, ME 350, and graduate standing.

Advanced principles of heat transfer. Classical solution techniques to problems in convection. 4 lectures.

ME 554. Computational Heat Transfer. 4 units

Term Typically Offered: SP

Prerequisite: MATH 418, ME 347, ME 350, and graduate standing.

Numerical solutions of classical, industrial, and experimental problems in conduction, convection, and radiation heat transfer. 3 lectures, 1 laboratory.

ME 556. Advanced Heat Transfer III. 4 units

Term Typically Offered: SP

Prerequisite: ME 347 or FPE 502; and ME 350.

Advanced principles of heat transfer. Classical solution techniques to problems in radiation with applications related to the role of radiation heat transfer in the development of fire in buildings. 4 lectures.

Crosslisted as FPE/ME 556.

ME 563. Graduate Seminar. 1 unit

Term Typically Offered: W

Prerequisite: Graduate standing in mechanical engineering program.

Current developments in mechanical engineering. Participation by graduate students, faculty and guests. 1 seminar.

ME 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. The Schedule of Classes will list topic selected. Total credit limited to 8 units; may be repeated in same term. 1-4 seminars.

ME 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. The Schedule of Classes will list topic selected. Total credit limited to 8 units; may be repeated in same term. 1-4 laboratories.

ME 579. Fluid Power Control. 4 units

Term Typically Offered: TBD

Prerequisite: ME 422.

Design, analysis, and control of fluid power systems. Analysis of fluid power system components such as valves, actuators, pumps and motors. System response and stability. Dynamic modeling and computer simulation 3 lectures, 1 laboratory.

ME 599. Design Project (Thesis). 1-9 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing.

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis.

Microbiology (MCRO)

MCRO Courses

MCRO 100. Introduction to Microbiology Research. 2 units

CR/NC

Term Typically Offered: W, SP

Prerequisite: BIO 161.

Group research experience in microbiology through participation in a faculty-student research project. Foundations of the scientific method including literature review, design of experiments, common laboratory techniques, data analysis, interpretation of results and scientific communication. Intended for freshmen and sophomores with no research experience. Priority to MCRO majors. Credit/No Credit grading only. 1 seminar, 1 laboratory.

MCRO 221. Microbiology. 4 units

GE Area B2; GE Area B4

Term Typically Offered: F,W,SP,SU

Prerequisite: CHEM 110 or CHEM 111 or CHEM 124 or CHEM 127 or PSC 102.

Morphology, metabolism, classification, and identification; microbiology of air, soil, water, and foods with applications to industry, agriculture, medicine, and public health. Not open to students with credit in MCRO 224; not open for major credit for BIO/MCRO/MSCI. 3 lectures, 1 laboratory. Fulfills GE B2 & B4.

MCRO 224. General Microbiology I. 5 units

GE Area B2; GE Area B4

Term Typically Offered: F,W,SP,SU

Prerequisite: BIO 161 and CHEM 111, CHEM 124 or CHEM 127.

Recommended: CHEM 128.

Microbial cellular structure and function, nutrition and growth dynamics, control of microbial growth, metabolism, genetics, and viruses. Both prokaryotic and eukaryotic microorganisms emphasized. 3 lectures, 2 laboratories. Fulfills GE B2 & B4.

MCRO 225. General Microbiology II. 5 units

Term Typically Offered: SP

Prerequisite: MCRO 224.

Microbial diversity, systematics, ecology, and symbiotic relationships. Introduction to host-microorganism interactions including pathogenesis, epidemiology, and immunology. 3 lectures, 2 laboratories.

MCRO 301. Wine Microbiology. 4 units

Term Typically Offered: SP

Prerequisite: MCRO majors must have MCRO 224; WVIT majors must have MCRO 221 or MCRO 224; and WVIT 202; open to MCRO or WVIT majors only.

Wine yeasts, bacteria, and molds: morphology and methods of identification; successful alcoholic and malolactic fermentations; management and prevention of unwanted microbial growth; microorganisms and flavor development. 3 lectures, 1 laboratory. Crosslisted as MCRO/WVIT 301.

MCRO 320. Emerging Infectious Diseases. 3 units

Term Typically Offered: F, W, SU

Prerequisite: BIO 161; and MCRO 221 or MCRO 224.

Recent outbreaks of human diseases, interrelationships between infectious disease agents, human biology, and the environment. Infectious agents and disease processes, virulence mechanisms, and host immune response. Clinical approaches and surveillance methods to detect, investigate, and monitor emerging pathogens. Factors involved in the accelerating emergence of diseases and bioterrorist agents. 3 lectures.

MCRO 342. Public Health Microbiology. 4 units

Term Typically Offered: W

Prerequisite: MCRO 221 or MCRO 224.

Principles of disease prevention and control. Water-, food-, and air-borne microbial contaminations and epidemiology of ensuing diseases. 3 lectures, 1 laboratory.

MCRO 402. General Virology. 4 units

Term Typically Offered: W

Prerequisite: BIO 351 or CHEM 373, or graduate standing in Biological Sciences. Recommended: BIO 452.

Infective macromolecules (prions, viroids, and viruses) associated with microbes, plants, and animals. Epidemiology, immune responses, pathogenicity, carcinogenesis, diagnoses, vaccination, and therapy. 3 lectures, 1 laboratory.

MCRO 421. Food Microbiology. 4 units

Term Typically Offered: F, SP

Prerequisite: MCRO 221 or MCRO 224. Recommended: CHEM 212/312.

Physiological activities of microorganisms involved in the preparation, preservation, deterioration, and toxicity of foods and related products. Detection and prevention of spoilage microorganisms and foodborne pathogens. 3 lectures, 1 laboratory.

MCRO 423. Medical Microbiology. 5 units

Term Typically Offered: F

Prerequisite: Junior standing; MCRO 225; and CHEM 216, CHEM 312 or CHEM 316; and consent of instructor.

Microorganisms as agents of disease in humans. Epidemiology, host-parasite relationships, and chemotherapy. The compromised host and opportunistic disease. Laboratory safety. Procedures for laboratory diagnosis of human diseases. Rapid miniaturized methods of identification. 3 lectures, 2 laboratories.

MCRO 424. Microbial Physiology. 5 units

Term Typically Offered: W

Prerequisite: MCRO 225 and CHEM 313 or CHEM 371, or graduate standing in Biological Sciences.

Cellular structure and life processes of bacteria; chemical composition, growth, and metabolism. General biological and evolutionary considerations. 3 lectures, 2 laboratories.

MCRO 433. Microbial Biotechnology. 3 units

Term Typically Offered: F

Prerequisite: MCRO 221 or MCRO 224; and BIO 303 or BIO 351 or equivalent; and CHEM 216, CHEM 312 or CHEM 316 or equivalent, or graduate standing in Biological Sciences.

Principles and methods used for production of enzymes, pharmaceuticals, chemicals, and food additives using micro-organisms. Topics include screening and strain improvement, regulation of metabolite production, genetic engineering, heterologous gene expression systems, large-scale production, and intellectual property. 3 lectures.

MCRO 436. Microbial Ecology. 4 units

Term Typically Offered: TBD

Prerequisite: BIO 160; BIO 161; BIO 263; and MCRO 221 or MCRO 224; or graduate standing in Biological Sciences.

Ecology and interactions of microorganisms in natural environments. Role of microorganisms in ecosystem function such as nutrient cycling, extreme environments, symbioses. Applications of microorganisms in the environment such as bioremediation, biocontrol, biofuels. Field trip may be required. 2 lectures, 2 activities.

Military Science Leadership (MSL)

MSL Courses

MSL 101. Foundation of Officership I. 1 unit

Term Typically Offered: F

Prerequisite: Freshman or sophomore standing.

Introduction to issues and competencies of the Army officer profession. Emphasis on stereotypes about the military, the role of the Army officer, customs and traditions within the military, and personal and physical development. 1 lecture.

MSL 102. Foundation of Officership II. 1 unit

Term Typically Offered: W

Prerequisite: Freshman or sophomore standing.

The role of leadership within a large organization. Emphasis on the definition of leadership, leadership framework, individual and organizational core values, and the moral responsibility of leadership. 1 lecture.

MSL 103. Basic Leadership. 1 unit

Term Typically Offered: SP

Prerequisite: Freshman or sophomore standing.

The foundation of basic leadership fundamentals such as problem solving, communications, briefings and effective writing, techniques for improving listening and speaking skills, and an introduction to counseling. 1 lecture.

MSL 110. Exercises in Military Leadership. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Enrollment in any MSL course or consent of department head.

Hands-on instruction on the proper execution of small-unit military operations. Incorporation of the military decision-making process in the planning, execution and conducting of a wide variety of squad, platoon and company sized missions. Credit/No Credit grading only. 1 activity.

MSL 111. Orienteering. 2 units

Term Typically Offered: W, SP

Principles of orienteering, basic map reading and compass skills; course running techniques applied in field orienteering events. Open to all freshmen and sophomores. 1 lecture, 1 activity.

MSL 112. The Army Physical Fitness Program. 1 unit

Term Typically Offered: F, W, SP

The Army Physical Fitness Program and its proper execution. Physical training to the Army standard with the goal of successfully passing the Army Physical Fitness Test. 1 laboratory.

MSL 201. Foundations of Leadership I. 2 units

Term Typically Offered: F

Prerequisite: Freshman or sophomore standing.

The development of individual leadership traits and capabilities using the Army officer as a model. The Army's problem solving methods, written and oral communications, tactics and group leadership. 2 lectures.

MSL 202. Foundations of Leadership II. 2 units

Term Typically Offered: W

Prerequisite: Freshman or sophomore standing.

The development of individual leadership traits and capabilities using the Army officer as a model. The Army's problem solving methods, tactics and group leadership. 2 lectures.

MSL 203. Foundations of Leadership III. 2 units

Term Typically Offered: SP

Prerequisite: Freshman or sophomore standing.

The development of individual leadership traits and capabilities using the Army officer as a model. The Army's problem solving methods, land navigation techniques, tactics and group leadership. 2 lectures.

MSL 212. Leader's Training Course. 1-7 units

Term Typically Offered: F

One to seven units of credit may be granted depending upon successful completion of training. Five weeks of training, Fort Knox, Kentucky. Travel pay and salary provided through the Military Science Department. No obligation. LTC graduates eligible to enroll in ROTC Advanced Program.

MSL 229. Ranger Challenge. 2 units

CR/NC

Term Typically Offered: F

Selection and preparation of the Ranger Challenge Team which will represent Cal Poly in military tactical skills competition. Includes rope bridging, orienteering, weapons knowledge, hand grenade accuracy, 10K road march with equipment, first aid, marksmanship, physical fitness and tactics. Credit/No Credit grading only. 2 activities.

MSL 240. American Military History and the Evolution of Western Warfare. 4 units

Term Typically Offered: W, SP

Comprehensive analysis of American military history from the early Anglo-French period to the end of the 20th Century. Examination of the strategies, operations and tactics of military warfare, and exploration of how social, economic, and technological factors produced the distinct patterns of war that characterize the struggles of the past two hundred plus years. Open to all students. 4 lectures.

MSL 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

MSL 275. Facilitation and Teambuilding. 2 units

Term Typically Offered: TBD

Techniques and models used in leadership, facilitation, and teambuilding. Emphasis on leadership and facilitation styles and models, teambuilding and group dynamics, and working with various populations. Field trip required. 2 seminars. Crosslisted as MSL/RPTA 275.

MSL 301. Tactical Leadership I. 3 units

Term Typically Offered: F

Prerequisite: Completion of MSL 101, MSL 102, MSL 103, MSL 201, MSL 202, MSL 203, or completion of MSL 212, and consent of department head.

Introduction to the life of a professional Army officer. Instruction in the operational art of small-unit leadership, and the roles and responsibilities of an Army 2nd Lieutenant in preparation for attendance at the Leader Development and Assessment Course. 3 lectures.

MSL 302. Tactical Leadership II. 3 units

Term Typically Offered: W

Prerequisite: MSL 301, and consent of instructor.

Continuation of study of the life of a professional Army officer. Instruction in the operational art of small-unit leadership, and the roles and responsibilities of an Army 2nd Lieutenant in preparation for attendance at the Leader Development and Assessment Course. 3 lectures.

MSL 303. Applied Leadership. 3 units

Term Typically Offered: SP

Prerequisite: MSL 301, MSL 302, and consent of instructor.

Demonstration of proficiency in leading small units. Emphasis on clear and concise oral communications, land navigation, weapons skills, and timely decision-making. Completion of training for the Leader Development and Assessment Course and preparation for attendance at the course. 3 lectures.

MSL 310. Advanced Leadership of Military Exercises. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: MSL 110. Recommended: MSL 203 or MSL 212.

The planning, resourcing and execution of selected Army tactical missions in a field environment, and leading all students enrolled in MSL 110. Total credit limited to 3 units. 1 activity.

MSL 312. Leadership of the Army Physical Fitness Program. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: MSL 112. Recommended: MSL 203 or MSL 212.

The planning, resourcing and execution of the Army Physical Fitness Program, and leading all students enrolled in MSL 112. Total credit limited to 3 units. 1 laboratory.

MSL 314. Leadership Development and Assessment Course. 6 units
CR/NC

Term Typically Offered: F

Prerequisite: MSL 301, MSL 302, MSL 303, and consent of instructor.

Five week summer training program required to achieve an Army commission. Testing and training as functional Army officers and determination of potential for service. Travel pay, room and board, and salary provided by the U.S. Army. Held at Fort Lewis, Washington. Credit/No Credit grading only.

MSL 400. Special Problems for Advanced Undergraduates. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

MSL 401. Developmental Leadership I. 3 units

Term Typically Offered: F

Prerequisite: MSL 301, MSL 302, MSL 303 and consent of instructor.

In-depth study and analysis of the duties and responsibilities of an ethical Army officer. Emphasis on honing skills required at follow-on training. Administrative actions and self and subordinate developmental processes utilized by an Army 2nd Lieutenant. 3 lectures.

MSL 402. Developmental Leadership II. 3 units

Term Typically Offered: W

Prerequisite: MSL 401 and consent of instructor.

Continuation of MSL 401 with a focus on communications and personal development. Continuation of in-depth study and analysis of the duties and responsibilities of an ethical Army officer. Emphasis placed on honing skills required at follow-on training. Administrative actions and self and subordinate developmental processes utilized by an Army 2nd Lieutenant. 3 lectures.

MSL 403. Adaptive Leadership. 3 units

Term Typically Offered: SP

Prerequisite: MSL 401 and MSL 402.

Beginning of transition from student to commissioned officer. Emphasis on expectations of an Army 2nd Lieutenant. Cultural awareness, effective command climates, terrorism and force protection in the current operational environment, and individual officer skills. 3 lectures.

MSL 410. Administration and Evaluation of Exercises in Military Leadership. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: MSL 303 or MSL 310. Recommended: MSL 314.

The supervision and evaluation of the organization, planning, resourcing, and execution of selected Army tactical missions, and mentoring assigned students enrolled in MSL 310. Total credit limited to 3 units. 1 activity.

MSL 412. Administration and Evaluation of the Army Physical Fitness Program. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: MSL 303 or MSL 312. Recommended: MSL 314.

The supervision and evaluation of the organization, planning, resourcing, and execution of the Army Physical Fitness Program, and mentoring assigned students enrolled in MSL 312. Total credit limited to 3 units. 1 laboratory.

MSL 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 lectures.

Music (MU)

MU Courses

MU 101. Introduction to Music Theory. 4 units

GE Area C3

Term Typically Offered: F, W, SP

Introduction to the elements of music and their use by composers and performers. Notation of pitch and rhythm, scales, key signatures, intervals and chords. 3 lectures, 1 activity. Fulfills GE C3.

MU 103. Music Theory I: Diatonic Materials. 4 units

Term Typically Offered: F, W

Prerequisite: MU 101 with a grade of C- or better, or consent of instructor.

Introduction to species counterpoint, structure of tonality, four-part writing of root position and inverted triads, dominant seventh chord, phrase structure, harmonic progressions, harmonization of a melody and nonharmonic tones. Composition project. 4 lectures.

MU 104. Musicianship I. 2 units

Term Typically Offered: F

Prerequisite: MU 101; Music majors may be concurrently enrolled in MU 101 and MU 104.

Introductory sightsinging in the major mode; rhythmic performance and dictation in simple and compound meters; identification and performance of melodic and harmonic intervals and triads; dictation of major diatonic melodies and chord progressions using the primary triads. 2 activities.

MU 105. Music Theory II: Chromatic Materials. 4 units

Term Typically Offered: W, SP

Prerequisite: MU 103 with a grade of C- or better, or consent of instructor.

Construction and resolution of diatonic seventh chords, secondary dominants, augmented sixth, and Neapolitan chords. Modal mixture and modulation to closely-related keys. Binary, ternary, and variation forms. Introduction to 18th-century counterpoint. Composition project. 4 lectures.

MU 106. Musicianship II. 2 units

Term Typically Offered: W

Prerequisite: MU 104 with a grade of C- or better, or consent of instructor.
Corequisite: MU 103.

Sightsinging and dictation in major and minor modes; performance and dictation of one- and two-part rhythms in simple and compound meters; syncopation; identification of compound intervals, triad inversions and cadence types; harmonic dictation using diatonic root position triads and the dominant seventh. 2 activities.

MU 108. Musicianship III. 2 units

Term Typically Offered: SP

Prerequisite: MU 106 with a grade of C- or better, or consent of instructor.

One- and two-part sightsinging and melodic dictation; alto and tenor clefs; one- and two-part rhythmic performance and dictation including syncopation and triplets; harmonic dictation including diatonic triads in all inversions and dominant and supertonic seventh chords; identification of phrase structure. 2 activities.

MU 114. Introduction to Composing. 4 units

Term Typically Offered: TBD

Prerequisite: MU 101 or consent of instructor.

Fundamental concepts in music composition. Creative projects. Compositional techniques, development, and structure. Analysis of examples from the literature. 3 lectures, 1 activity.

MU 120. Music Appreciation. 4 units

GE Area C3

Term Typically Offered: F, W, SP

Explores the world of music with emphasis on Western tradition. Language of music, the role of music in society. Historical context and major composers from the Middle Ages to the present. 3 lectures, 1 activity. Fulfills GE C3.

MU 121. Introduction to Non-Western Musics. 4 units

Term Typically Offered: SP

Prerequisite: Music major, minor, or consent of instructor.

Survey of selected non-Western music cultures. Emphasis on listening and understanding the ensemble type, aesthetic principle, musical style, and performance practice of each. 3 lectures, 1 activity.

MU 149. Applied Study/Technique. 1 unit

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual instruction in performance with emphasis on the technical skills needed for the performance of repertoire. Total credit limited to 3 units. The Schedule of Classes will list topic selected.

MU 150. Applied Music. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 6 units. The Schedule of Classes will list topic selected.

MU 151. Beginning Class Piano. 2 units

Term Typically Offered: F, W, SP

Beginning piano for student with no background in keyboard instruments. Includes fundamentals of notation, keyboard techniques, tone production, sightreading and facility. 1 lecture, 1 activity.

MU 152. Elementary Class Piano. 1 unit

Term Typically Offered: TBD

Prerequisite: MU 151 or consent of instructor; for non-music majors.

Continuation of MU 151. Piano for students with the ability to play a simple Bach or Mozart Minuet. Total credit limited to 3 units. 1 activity.

MU 154. Beginning Voice. 1 unit

Term Typically Offered: F, W, SP

Beginning study of vocal and performance technique for the untrained singer. Includes the beginning study of the vocal mechanism and the fundamentals of notation. 1 activity.

MU 155. Beginning Guitar. 1 unit

Term Typically Offered: F, W, SP

Fundamentals of guitar technique and performance. Elements of classical, pop, and folk styles. Basics of staff and chord notations. No previous experience necessary. 1 activity.

MU 161. Piano Skills I. 1 unit

Term Typically Offered: F

Prerequisite: Music major or consent of instructor.

Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody, score-reading. 1 activity.

MU 162. Piano Skills II. 1 unit

Term Typically Offered: W

Prerequisite: MU 161 or consent of instructor.

Continuation of MU 161. Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody, score-reading. 1 activity.

MU 163. Piano Skills III. 1 unit

Term Typically Offered: SP

Prerequisite: MU 162 or consent of instructor.

Continuation of MU 162. Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody, score-reading. 1 activity.

MU 168. Piano Accompanying. 1 unit

Term Typically Offered: F, W, SP

Corequisite: MU 253 or piano topic in any of the following courses: MU 150, MU 250, MU 350 or MU 450; or consent of instructor.

Preparation and performance of vocal and instrumental music written with piano accompaniment. Choral rehearsal accompanist techniques. Open to students who are proficient on piano at a collegiate level. Total credit limited to 6 units. 1 activity.

MU 170. University Jazz Band. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Rehearsal and public performance of jazz big band repertoire. Open to qualified students who sing or who play trumpet, trombone, saxophone, piano, guitar, vibes, bass, drums, or congas. Total credit limited to 6 units. 1 laboratory.

MU 171. Instrumental Ensembles. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Open to qualified musicians. Rehearsal and public performances in large and small ensembles. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 1 activity.

MU 172. Wind Orchestra. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Study and public performance of music written for large wind band. Open to all qualified students who perform on woodwind, brass, and percussion instruments. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 1 laboratory.

MU 173. Wind Ensemble. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Study and public performance of music written for wind bands with limited doubling and flexible instrumentation. Open to all students who perform on woodwind, brass and percussion instruments on an advanced collegiate level. Total credit limited to 6 units. 1 laboratory.

MU 174. Symphony Orchestra. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor, based on audition.

Preparation and performance of orchestral music including both the standard repertoire and rarely performed works. Open to all qualified students. Total credit limited to 6 units. 1 laboratory.

MU 176. Mustang Band. 1 unit

Term Typically Offered: F, W

Prerequisite: Consent of instructor.

Public performance of music and specially-designed shows written for marching band (woodwinds, brass, percussion, and flag team auxiliary). Limited to those students who have had marching experience with wind and percussion instruments, or flag, rifle or dance lines. Total credit limited to 6 units. 1 laboratory.

MU 177. Chamber Winds. 1 unit

Term Typically Offered: F

Prerequisite: Consent of instructor.

Study and public performance of chamber music written for woodwinds, brass, or percussion. Open to all instrumentalists who have high school or college level performance experience. Total credit limited to 6 units. 1 activity.

MU 178. Field Show Marching Skills. 1 unit

Term Typically Offered: F

Study and application of advanced field show marching techniques used in performance by the Cal Poly Mustang Band and other university bands. Limited to those students who have experience performing on a wind/percussion instrument, or in a marching band flag/dance team auxiliary. Total credit limited to 6 units. 1 activity.

MU 181. Polyphonics. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Study and public performance of music for mixed voices. Total credit limited to 6 units. 1 laboratory.

MU 183. Vocal Ensemble. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Open to qualified singers. Rehearsal and performance of specialized vocal music. Total credit limited to 6 units. 1 activity.

MU 185. University Singers. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Study and public performance of music for large mixed chorus. Total credit limited to 6 units. 1 laboratory.

MU 186. Early Music Ensemble. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Study and public performance of vocal and instrumental music from 1200 to 1750. Total credit limited to 6 units. 1 laboratory.

MU 188. Arab Music Ensemble. 1 unit

Term Typically Offered: F, W, SP

Rehearsal and performance of instrumental and vocal repertoire drawn from art and popular music of wide-ranging Arabic-speaking societies and historically related cultures. Accompanying music theories, instrumental techniques, and performance practices, with presentation of seminal works in public concerts. Total credit limited to 6 units. 1 laboratory.

MU 189. Vocal Practicum. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: MU 150, MU 250, MU 350 or MU 450, or consent of instructor.

Study and implementation of performing techniques used by vocalists in a recital or concert setting. Total credit limited to 6 units. 1 activity.

MU 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

MU 210. Musicianship IV. 1 unit

Term Typically Offered: F

Prerequisite: MU 108 with a grade of C- or better, or consent of instructor.

Corequisite: MU 105.

Continuation of MU 108. Sightsinging and melodic dictation using chromatic tones; rhythmic performance in changing meters; harmonic dictation including seventh chords, secondary dominants, and modulation to closely-related keys; seventh chord inversions; and aural identification of binary and ternary forms. 1 activity.

MU 211. Musicianship V. 1 unit

Term Typically Offered: W

Prerequisite: MU 210 with a grade of C- or better, or consent of instructor.

Continuation of MU 210. Sightsinging using chromatic tones; rhythmic performance and dictation in changing and asymmetric meters; harmonic dictation including Neapolitan triads, augmented sixth chords, modal mixture, and modulation to closely-related keys; aural identification of sonata, rondo, and variation forms. 1 activity.

MU 212. Musicianship VI. 1 unit

Term Typically Offered: SP

Prerequisite: MU 211 with a grade of C- or better, or consent of instructor.

Continuation of MU 211. Emphasis on previously acquired skills, plus sightsinging, melodic dictation, and harmonic dictation using modulation to foreign keys; performance and dictation of cross-rhythms and complex beat divisions; tempo modulation; aural identification of contrapuntal genres; and modulatory melodic dictation in two parts. 1 activity.

MU 221. Jazz Styles. 4 units

GE Area C3; USCP

Term Typically Offered: W, SP

Survey of Jazz as a significant American art form from 1900 to the present; its historical background and development in the United States; key elements, leading performers, and significant compositions in each style. Emphasis on listening skills. 3 lectures, 1 activity. Fulfills GE C3 and USCP.

MU 227. Popular Music of the USA. 4 units

GE Area C3; USCP

Term Typically Offered: TBD

Recommended: GE Area A1, GE Area A2, or GE Area A3.

Study of popular music of USA from the nineteenth century to contemporary times. Emphases include understanding of cultural identity, social diversity, musical aesthetics, and artistic significance. Investigations engage ethnic relations, gender issues, religious expression, performance practice, technological development, modernization, commodification, and political empowerment. 3 lectures, 1 activity. Fulfills GE C3 and USCP.

MU 229. Music of the 60's: War and Peace. 4 units

GE Area C3; USCP

Term Typically Offered: W

Explores wide spectrum of rock, folk and pop styles of the 60s. Relates music to social turmoil and historical trends, including Vietnam War, Civil Rights Movement, American Indian Movement, Chicano Movement, Free Speech Movement. 3 lectures, 1 activity. Fulfills GE C3 and USCP.

MU 249. Applied Study/Technique. 1 unit

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual instruction in performance with emphasis on the technical skills needed for the performance of repertoire. Total credit limited to 3 units.

MU 250. Applied Music. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: 3 units of MU 150 and consent of instructor.

Individual instruction in performance with emphasis on repertoire, technical skills, style, and interpretation. Total credit limited to 6 units. Specific areas of study are listed in the Class Schedule.

MU 253. Advanced Class Piano. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: MU 153 or consent of instructor; for non-music majors.

Advanced level piano techniques with emphasis on style, interpretation, sightreading, basic performance practices and the solution to general musical problems. Total credit limited to 3 units. 1 activity.

MU 259. Beginning Jazz Improvisation. 2 units

Term Typically Offered: TBD

Prerequisite: Facility on a musical instrument or singing ability; MU 101 or consent of instructor.

Development of fundamentals of jazz improvisation including scales, arpeggios, patterns, swing feel, expressiveness, and motifs through in-class performance of written materials and improvisations with play-along recordings. Total credit limited to 6 units. 2 activities.

MU 261. Piano Skills IV. 1 unit

Term Typically Offered: F

Prerequisite: MU 163 or consent of instructor.

Continuation of MU 163. Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, and improvisation of a melody, score-reading. 1 activity.

MU 262. Piano Skills V. 1 unit

Term Typically Offered: W

Prerequisite: MU 261 or consent of instructor.

Continuation of MU 261. Preparation for Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody, score-reading. 1 activity.

MU 263. Piano Skills VI. 1 unit

Term Typically Offered: SP

Prerequisite: MU 262 or consent of instructor.

Continuation of MU 262. Completion of this course with a C- or better represents fulfillment of the Piano Proficiency Examination. Study of piano repertoire, sightreading, transposition, harmonization of a melody, accompanying, improvisation of a melody, score-reading. 1 activity.

MU 265. Accelerated Piano Skills. 1 unit

Term Typically Offered: W

Prerequisite: Consent of instructor.

Preparation for Piano Proficiency Examination. For students with an extensive piano repertoire background but needing focused preparation in sightreading, transposition, harmonization of a melody, accompanying, and score reading. Total credit limited to 3 units. 1 activity.

MU 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

MU 301. Counterpoint. 4 units

Term Typically Offered: SP

Prerequisite: MU 105.

Counterpoint as a compositional technique. Modal, tonal, and post-tonal practices. Composition project. 4 lectures.

MU 303. Music Theory III: Advanced Chromaticism. 4 units

Term Typically Offered: F

Prerequisite: MU 105 with a grade of C- or better, or consent of instructor.

Compositional procedures employed by composers of the Classical and Romantic periods. Chromatic third-related harmony, linear chromaticism, and extended tertian chords. Chromatic and enharmonic modulation to distantly-related keys. Sonata and rondo forms. Composition project. 4 lectures.

MU 305. Music Theory IV: Contemporary Practices. 4 units

Term Typically Offered: W

Prerequisite: MU 303 or permission of instructor.

Examination of 20th- and 21st-century compositional practices including impressionism, developments in rhythm, polytonality, non-serial atonality, serialism, timbre and form, neoclassicism, minimalism, and the new eclecticism. Analysis and creative projects. 4 lectures.

MU 311. Sound Design: Technologies. 4 units

Term Typically Offered: F

Prerequisite: MU 101, MU 120 or consent of instructor.

Fundamental tools of electroacoustic sound design. Concepts and application of music studio procedure, recording, synthesis, and MIDI. Studio projects. 3 lectures, 1 activity.

MU 312. Sound Design: Recording. 4 units

Term Typically Offered: W

Prerequisite: MU 311 or permission of instructor.

Exploring creative use of recording technology. Analog and digital equipment for recording music. Analysis and creative projects. 3 lectures, 1 activity.

MU 320. Music Research and Writing. 4 units

Term Typically Offered: F

Prerequisite: Completion of GE Area A1 with a grade of C- or better; and MU 105. Recommended: MU 120.

Methodology for researching, analyzing, and writing about music. Exploration of investigative tools including library resources, periodicals, bibliographic tools, computerized search methods. Performance practice. 4 lectures.

MU 324. Music and Society. 4 units

GE Area C4

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and a foundation course in Area C.

Exploration into the role of music historically and culturally. Emphasis on deeper understanding and appreciation of the context of music through topics of special interest. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures, 1 activity. Fulfills GE C4 except for Music majors.

MU 325. America's Music. 4 units

USCP

Term Typically Offered: SP

Prerequisite: MU 105. Recommended: MU 120.

Explorations of the many styles of America's music through lectures, readings, sound recordings, musical scores, and performance. Includes 'Native American,' 'folk,' 'popular,' and 'fine art' traditions. How American music reflects the different cultural heritages, social contexts, and philosophies of its creators. 4 lectures. Fulfills USCP.

MU 326. Cultural Concepts and Structures in Music. 4 units

Term Typically Offered: TBD

Prerequisite: MU 121 or consent of instructor.

Exploring the definition, concepts, and structures of music in terms of theory, performance practice, and compositional procedures of selected non-Western cultures. 3 lectures, 1 activity.

MU 328. Women in Music. 4 units

GE Area C4; USCP

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and a foundation course in Area C.

Survey of women's contributions as composers and performers of western art and popular music; historical overview of the experiences and perception of women as musicians. 3 lectures, 1 activity. Fulfills GE C4 except for Music majors.

MU 331. Music of the Middle Ages and Renaissance. 4 units

Term Typically Offered: W

Prerequisite: MU 320 or consent of instructor. Recommended: MU 120.

Musical literature, styles, composers, theory, genres and notation of the Middle Ages and Renaissance. Relationship to historical trends. 4 lectures.

MU 332. Music of the Baroque and Early Classic Eras. 4 units

Term Typically Offered: SP

Prerequisite: MU 320 or consent of instructor. Recommended: MU 120.

Survey of the history of western art music from 1600 to 1780. 4 lectures.

MU 336. Jazz History and Theory. 4 units

Term Typically Offered: TBD

Prerequisite: MU 105.

Survey of Jazz theoretical techniques. Emphasis upon historical context and development of Jazz through study and analysis of scores and historical performances. 4 lectures.

MU 340. Conducting: Fundamentals. 2 units

Term Typically Offered: TBD

Prerequisite: MU 105 or consent of instructor.

Principles and techniques of conducting with experience in score reading. 2 activities.

MU 341. Conducting: Choral. 2 units

Term Typically Offered: TBD

Prerequisite: MU 340.

Continuation of MU 340. Emphasis on choral literature. Score reading, rehearsal techniques, and musical details associated with vocal music. 2 activities.

MU 342. Conducting: Instrumental. 2 units

Term Typically Offered: TBD

Prerequisite: MU 340.

Continuation of MU 340. Emphasis on band and orchestra literature. Score reading, rehearsal techniques, and musical details associated with instrumental music. 2 activities.

MU 350. Applied Music. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual instruction in performance and composition. Total credit limited to 6 units. Specific areas of study are listed in the Class Schedule.

MU 351. Jazz and Popular Music Arranging. 2 units

Term Typically Offered: W

Prerequisite: MU 105.

Arranging for small and large jazz ensembles. Score and part preparation. 2 activities.

MU 352. Orchestration. 4 units

Term Typically Offered: TBD

Prerequisite: MU 105.

Ranges, transposition, technical capabilities, and scoring of vocal ensembles, band, and orchestra instruments. Creative project. 3 lectures, 1 activity.

MU 360. Music for Classroom Teachers. 4 units

Term Typically Offered: TBD

Prerequisite: MU 101.

Development of skills for fostering creative music experiences in the classroom. Exploration of various approaches to motivating children musically. Study of folk songs for singing, playing instruments, and learning about music as well as for their ethnic and cultural significance. 3 lectures, 1 activity.

MU 361. Instruments. 1 unit

Term Typically Offered: TBD

Prerequisite: Junior standing and consent of instructor.

Fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 1 activity.

MU 368. Piano Accompanying. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and MU 168 or consent of instructor.

Preparation and performance of vocal and instrumental music written with piano accompaniment. Choral rehearsal accompanist techniques. Open to students who are proficient on piano at a collegiate level. Total credit limited to 6 units. 1 activity.

MU 370. University Jazz Band. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of instructor.

Rehearsal and public performance of jazz big band repertoire. Open to qualified students who sing or play trumpet, trombone, saxophone, piano, guitar, vibes, bass, drums, or congas. Total credit limited to 6 units. 1 laboratory.

MU 371. Instrumental Ensemble. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of instructor.

Open to qualified musicians. Rehearsal and public performance in large and small ensembles. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 1 activity.

MU 372. Wind Orchestra. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of instructor.

Study and public performance of music written for large wind band. Open to all qualified students who perform on woodwind, brass and percussion instruments. The Schedule of Classes will list topic selected. Total credit limited to 6 units. 1 laboratory.

MU 373. Wind Ensemble. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of instructor.

Study and public performance of music written for wind band with limited doubling and flexible instrumentation. Open to all students who perform on woodwind, brass and percussion instruments on an advanced collegiate level. Total credit limited to 6 units. 1 laboratory.

MU 374. Symphony Orchestra. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of instructor.

Preparation and performance of orchestral music including both the standard repertoire and rarely performed works. Open to all students whose technique is adequate. Total credit limited to 6 units. 1 laboratory.

MU 376. Mustang Band. 1 unit

Term Typically Offered: F, W

Prerequisite: Junior standing and consent of instructor.

Public performance of music and specially-designed shows written for marching band (woodwinds, brass, percussion, and flag team auxiliary). Limited to those students who have had marching experience with wind and percussion instruments, or flag, rifle or dance lines. Total credit limited to 6 units. 1 laboratory.

MU 377. Chamber Winds. 1 unit

Term Typically Offered: F

Prerequisite: Consent of instructor.

Study and public performance of chamber music written for woodwinds, brass, or percussion. Open to all instrumentalists who have college level performance experience. Total credit limited to 6 units. 1 activity.

MU 378. Field Show Marching Skills. 1 unit

Term Typically Offered: F

Prerequisite: MU 178 or consent of instructor.

Study and application of advanced field show marching techniques used in performance by the Cal Poly Mustang Band and other university bands. Limited to those students who have experience performing on a wind/percussion instrument, or in a marching band flag/dance team auxiliary. Total credit limited to 6 units. 1 activity.

MU 381. Polyphonics. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of instructor.

Study and public performance of music for mixed voices. Total credit limited to 6 units. 1 laboratory.

MU 383. Vocal Ensemble. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of instructor.

Open to qualified singers. Rehearsal and performance of specialized vocal music. Total credit limited to 6 units. 1 activity.

MU 385. University Singers. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of instructor.

Study and public performance of music for large mixed chorus. Total credit limited to 6 units. 1 laboratory.

MU 386. Early Music Ensemble. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor; junior standing.

Study and public performance of vocal and instrumental music from 1200 to 1750. Total credit limited to 6 units. 1 laboratory.

MU 388. Arab Music Ensemble. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: MU 188 or consent of instructor.

Rehearsal and performance of instrumental and vocal repertoire drawn from art and popular music of wide-ranging Arabic-speaking societies and historically related cultures. Accompanying music theories, instrumental techniques, and performance practices, with presentation of seminal works in public concerts. Total credit limited to 6 units. 1 laboratory.

MU 389. Vocal Practicum. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: MU 150, MU 250, MU 350 or MU 450, or consent of instructor.

Study and implementation of performing techniques used by vocalists in a recital or concert setting. Total credit limited to 6 units. 1 activity.

MU 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

MU 411. Sound Design: Synthesis. 4 units

Term Typically Offered: SP

Prerequisite: MU 312.

Compositional application of sound synthesis techniques. Realization of computer music. Creative projects. 3 lectures, 1 activity.

MU 412. Sound Design: Composition and Production. 4 units

Term Typically Offered: TBD

Prerequisite: MU 312.

Production of electroacoustic music in media. Program analysis, technical planning, composition, and product development. 3 lectures, 1 activity.

MU 431. Music of the Classic and Romantic Eras. 4 units

Term Typically Offered: F

Prerequisite: MU 303 and MU 320; Recommended: MU 120; or consent of instructor.

Survey of the history of western art music from 1780 to 1900. 4 lectures.

MU 432. Music of the Modern Era. 4 units

Term Typically Offered: W

Prerequisite: MU 303; and one of the following: MU 331, MU 332, or MU 431. Recommended: MU 305.

Composers, important works, and significant trends in the Western European and American classical tradition during the 20th and 21st Centuries. 4 lectures.

MU 449. Applied Study/Technique. 1 unit

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual instruction in performance with emphasis on the technical skills needed for the performance of repertoire. Total credit limited to 3 units. The Schedule of Classes will list topic selected.

MU 450. Applied Music. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual instruction in performance and composition. Total credit limited to 6 units. Specific areas of study are listed in the Class Schedule.

MU 461. Senior Project. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing and consent of department head.

Selection and completion of a project under faculty supervision. Minimum of 90 hours total time. Results presented in a recital, creative work, formal report, or a combination of all three.

MU 465. Choral Literature and Rehearsal Techniques. 4 units

Term Typically Offered: W

Prerequisite: MU 341, or consent of instructor.

Survey of choral literature especially suited for secondary schools. Philosophy and strategy for developing a school program. Musical as well as non-musical techniques for effective rehearsal. 3 lectures, 1 activity.

MU 466. Instrumental Literature and Rehearsal Techniques. 4 units

Term Typically Offered: SP

Prerequisite: MU 101 or MU 103; and MU 172 or MU 173 or MU 174.

Survey of instrumental literature written for orchestras, bands, solo instrument, and chamber ensembles. Philosophy and strategy necessary for developing a professional, semi-professional, or school instrumental music program. Musical as well as non-musical techniques for effective rehearsal. 3 seminars, 1 activity.

MU 470. Music History: Selected Advanced Topics. 4 units

Term Typically Offered: TBD

Prerequisite: MU 331, MU 332, MU 431, MU 432, or consent of instructor.

Intensive study of selected topics in music history through the use of readings, recordings, scores, and class presentations. The Schedule of Classes will list topics selected. Total credit limited to 8 units. 3 lectures, 1 activity.

Natural Resources (NR)

NR Courses

NR 140. Careers in Natural Resources Management and Environmental Sciences. 1 unit

CR/NC

Term Typically Offered: F

Analysis and development of career goals in natural resources and environmental sciences. Acquainting students with potential career options and preparation of academic plans for the majors in the Natural Resources Management and Environmental Sciences Department. Credit/No Credit grading. 1 activity. Crosslisted as ERSC/NR 140.

NR 141. Introduction to Forest Ecosystem Management. 3 units

Term Typically Offered: F

Fundamentals of forestry including basic silviculture, forest protection, measurement and policy. Integrated resource management of forest lands for water production, forage, recreation, wildlife, and timber. 3 lectures.

NR 142. Environmental Management. 3 units

Term Typically Offered: F

Recommended: NR 140.

Environmental management as a process within functioning societies seeking a harmonious balance between human activities and intrinsic behavior of the natural environment. Major components of the natural environment and the political and social activities that impact that environment. 3 lectures.

NR 203. Resource Law Enforcement. 3 units

Term Typically Offered: W

Law enforcement applied to natural resource conservation on public and private lands. Examination of state and federal laws related to fish and wildlife management. Problems associated with implementation of resource laws examined. 3 lectures. Crosslisted as NR/RPTA 203.

NR 204. Wildland Fire Control. 3 units

Term Typically Offered: SP

Fire control techniques used on various wildland fuels. Elementary fire physics, fuels, weather, fire behavior, tactics and fire suppression techniques, line construction, 'mop-up', fire line safety, air operations and fire organization. Meets basic wildland fire fighter certification requirements for the USDA Forest Service. Partially meets California Department of Forestry Firefighter I requirements. 2 lectures, 1 laboratory.

NR 208. Dendrology. 4 units

Term Typically Offered: F, W, SP

Recommended: BOT 121.

Identification, classification, silvical characteristics, distribution, environmental requirements and economic importance of woody plants in shrub, woodland, and forest ecosystems of the United States. Emphasis on species located in the Pacific Coastal, Sierran, and Cascade ecosystems. 2 lectures, 2 laboratories.

NR 215. Land and Resource Measurements. 1 unit

Term Typically Offered: F, W, SP

Introduction to land and resource measurement technology and methods - field instruments, property description, map and photograph reconciliation, data accuracy and precision. Trigonometric functions as applied to natural resources applications. Field trips required. 1 laboratory.

NR 218. Applications in GIS. 3 units

Term Typically Offered: F,W,SP,SU

ARC/INFO and ArcView Geographic Information System (GIS) computer software to explore environmental, natural resource, social and economic issues using spatial data. Develop and apply data base and software management competencies. 1 lecture, 2 laboratories. Crosslisted as LA/NR 218.

NR 247. Forest Surveying. 2 units

Term Typically Offered: F, W, SP

Prerequisite: NR 215.

Use and care of tapes, staff compass, abney levels, total stations, and GPS receivers. Keeping field notes, measurements by tape. Closed and open traverse by compass and total stations. Turning angles and determining directions of lines. Map reading and public land description. GPS measurements. Weekend field trips required. 1 lecture, 1 laboratory. Crosslisted as BRAE/NR 247.

NR 260. Forest Practices and Environmental Protection. 4 units

Term Typically Offered: SP

Recommended: NR 141 and NR 215.

Relationships between forest ecosystem management, forest practices, harvesting methods, timber harvest planning, components of forest harvesting, harvesting effects; cost analysis of harvesting methods; safety management; value-added forest utilization; environmental protection; and road location. Overnight or weekend field trips required. 3 lectures, 1 laboratory.

NR 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

NR 290. Intercollegiate Forestry Activities. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Enrollment limited to those qualified to compete in intercollegiate forestry activities and consent of instructor.

Beginning through advanced skills in the event areas of college forestry activities. Instruction in use of specialized equipment and safety. Minimum of 4 hours of laboratory per week. Total credit limited to 18 units. Credit/No Credit grading only.

NR 306. Natural Resource Ecology and Habitat Management. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Areas B2 and B4.

Resource ecology and management implications in the major ecosystems of North America. Importance of maintaining the natural dynamics of energy flow and nutrient cycles at the community and ecosystem level to sustain uses and values. Humanity's role as a principal factor of change of the resources in natural systems. 3 lectures, 1 laboratory.

NR 307. Fire Ecology. 3 units

Term Typically Offered: SP

Prerequisite: Completion of GE Areas B2 and B4.

Effects of wildland fires on shrub, woodland, and forest environments to include fuels, plants, soil, water, wildlife, and air. Emphasis on western U.S. forest and shrub ecosystems. 2 lectures, 1 laboratory.

NR 308. Fire and Society. 4 units

GE Area D5

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A3 with a grade of C- or better; and one lower division course in GE Area D.

Prehistorical and historical record of human use of and attitude toward fire. Mythology and religion of fire. Traditional, cultural and ethnic variations and their influence on modern U.S. institutions involved in managing fire. 3 lectures, 1 activity. Crosslisted as ES/NR 308. Fulfills GE D5.

NR 312. Technology of Wildland Fire Management. 4 units

GE Area F

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and completion of GE Area B2 or B3.

Models and technology to solve complex land management problems. Historic, current and future perspectives of wildland fire in California. Sustainability and ecosystem health. Assumptions and limitations of fire behavior and suppression models. 3 lectures, 1 activity. Fulfills GE Area F.

NR 314. Environmental Life-Cycle Analysis. 4 units

Term Typically Offered: W, SP

Prerequisite: NR 306.

Estimation and assessment of environmental impacts of human activity and product development using life-cycle analysis methodology; organization and presentation of modeling results. 3 lectures, 1 laboratory.

NR 315. Measurements and Sampling in Forested Environments. 4 units

Term Typically Offered: W, SP

Prerequisite: BRAE 239 or BRAE/NR 247; and STAT 217 or STAT 218.

Recommended: MATH 161 or MATH 221 or equivalent.

Principles and methods of sampling and measurement for forest and natural resource quantities and qualities. Modeling and estimation for tree volumes, stand structure and composition, and related forest vegetation. Applications in sampling, statistical and inventory techniques. 2 lectures, 2 laboratories. Overnight, weekend field laboratories required.

NR 317. The World of Spatial Data and Geographic Information Technology. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B2.

Basic foundation for understanding the world through geographic information and tools available to utilize spatial data. Application of Geographic Information Systems (GIS) and related technologies, including their scientific basis of operation. Not open to students with credit in LA/NR 218. 3 lectures, 1 activity. Crosslisted as LA/NR 317. Fulfills GE Area F.

NR 320. Watershed Processes and Management. 4 units

Term Typically Offered: F, W, SP

Prerequisite: NR/LA 218 and SS 121. Recommended: NR 306.

Introduction, analysis, and measurement of watershed processes of precipitation, evapotranspiration, streamflow, stream channels, erosion, and riparian functions. Watershed management toward aquatic habitat and water quality goals. Weekend field trip required. 3 lectures, 1 laboratory.

NR 321. Water Systems Technology, Issues and Impacts. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B2.

Sustainable strategies and technologies to enhance freshwater supplies and marine habitats. Systems treated include artificial wetlands, stormwater, drinking water, agricultural and industrial waste water. 3 lectures, 1 activity. Fulfills GE Area F.

NR 323. Human Dimensions in Natural Resources Management. 4 units
GE Area D5

Term Typically Offered: W, SP

Prerequisite: Junior standing; completion of GE Area A3 with a grade of C- or better; and GE Area D1.

Social, economic, political and ecological conditions and institutions that influence decisions affecting the environment; examination of human-caused environmental impacts and how they in turn influence social institutions. 4 lectures. Fulfills GE D5 except for Forestry and Natural Resources majors.

NR 324. Social Dimensions of Sustainable Food and Fiber Systems. 4 units

GE Area D5

Term Typically Offered: W

Prerequisite: Completion of GE Area A with a grade of C- or better; completion of 2 lower division courses in GE Area D; and junior standing.

Historical, political, socio-economic, and cultural dimensions of sustainable food and fiber systems. Overview of frameworks used for understanding agro-ecological sustainability with an emphasis on human elements. Exploration of core sustainability concepts, practices, and goals through case studies. 4 lectures. Fulfills GE D5 except for Environmental Management and Protection majors.

NR 326. Natural Resources Economics and Valuation. 4 units

Term Typically Offered: F, W

Prerequisite: MATH 161 or MATH 221 or equivalent. Recommended: GE Area D2 (ECON 201 recommended), AGB 212.

Theory of efficient use of renewable and nonrenewable natural resources, including methods for attaching value to marketable and non-market natural resources. Environmental economic theories and techniques to address allocation of water, timber, wildlife/fisheries, open space, and recreation. 3 lectures, 1 activity.

NR 335. Conflict Management in Natural Resources. 4 units

Term Typically Offered: F, W

Prerequisite: NR 141 or NR 142. Recommended: PSY 201 or PSY 202.

Application of behavioral science principles and techniques in the management of natural resource systems. Management of internal and external human resource issues and concerns in natural resources organizations is emphasized. 3 lectures, 1 laboratory.

NR 339. Internship in Forest and Natural Resources. 1-12 units
CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Selected students will spend up to 12 weeks with an approved firm or agency engaged in forest or natural resources management. Applying and developing managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Credit/No Credit grading.

NR 340. Wildland Fire Management. 3 units

Term Typically Offered: F

Prerequisite: NR 204.

Wildland fuels, fire weather, and fire danger ratings in chaparral, grassland, and forested areas. Advanced modeling of surface and crown fire behavior. Fire management strategies and implications, policies and objectives of fire management organizations. Saturday field trips may be required. 3 lectures.

NR 350. Urban Forestry. 3 units

Term Typically Offered: TBD

Prerequisite: NR 208.

Establishment and management of municipal forests, wildland-urban interface, wildlife habitat, and pollution abatement. Management of forest areas requiring special attention because of heavy recreational use, fire hazard, watershed, and societal values. Full-day field trips may be required. 2 lectures, 1 laboratory.

NR 351. Introduction to Emergency Management in California. 3 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area B3 or D.

Emergency management emphasizing the Standardized Emergency Management System (SEMS) and Emergency Operations Center (EOC) operations. Earthquake hazard used as the case to explore potential wide geographic impacts, multiple secondary hazards, and multidisciplinary problem-solving methods in natural disasters faced by local governments and communities. 2 lectures, 1 activity. Crosslisted as CRP/NR 351.

NR 360. Ethnicity and the Land. 4 units

GE Area C4; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area C. Recommended: One lower division Ethnic Studies course and an introductory natural resources course.

Comparative study of how race and culture shape landscapes, and how social hierarchies allocate the use of natural resources and the burdens of environmental pollution. 4 lectures. Crosslisted as ES/NR 360. Fulfills GE C4 and USCP.

NR 365. Silviculture and Vegetation Management. 4 units

Term Typically Offered: F, SP

Prerequisite: NR 208 and NR 315. Corequisite: NR 260 and NR 306.

Applied forest ecology focusing on development of prescriptions for achieving diverse forest ecosystem management objectives. Topics include natural stand dynamics, traditional/contemporary silvicultural systems, forest health assessments/diagnoses, emulating natural disturbances, and managing ecosystem services. Overnight and/or weekend field trips required. 2 lectures, 2 laboratories.

NR 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 12 units.

NR 401. Disaster Recovery. 3 units

Term Typically Offered: TBD

Prerequisite: CRP/NR 351.

Strategies and procedures for public sector management of recovery from disasters. Understanding the role of, and relationship between, federal, state and local agencies to provide assistance to individuals and communities in the post-disaster environment. Issues in the recovery process. 2 lectures, 1 activity. Crosslisted as CRP/NR 401.

NR 402. Forest Health. 4 units

Term Typically Offered: W

Prerequisite: NR 208, and NR 306 or BIO 325, or consent of instructor.

Impact and losses to forested areas caused by physical and biotic agents (such as insects and diseases) other than fire; relation of direct and indirect control practices to forest management. Saturday field trips required. 3 lectures, 1 laboratory.

NR 404. Environmental Law. 3 units

Term Typically Offered: F, W

Prerequisite: Junior standing.

Detailed examination of the law governing use and protection of natural resources with focus on the legal institutions entrusted with the public duty of protecting the environment. 3 lectures. Crosslisted as CRP/NR 404.

NR 406. Indigenous Peoples and International Law and Policy. 4 units

Term Typically Offered: W

Prerequisite: ES 241; and NR 141 or NR 142; and junior standing required.

Interdisciplinary examination of the evolution of international law effecting indigenous peoples in the U.S. and in the Americas. Development of international legal and sociological norms and their impact on human rights of indigenous peoples with particular attention to environmental issues. 4 lectures. Crosslisted as ES/NR 406.

NR 408. Water Resource Law and Policy. 3 units

Term Typically Offered: SP

Prerequisite: Junior standing.

Detailed examination of the various legal systems of water use, regulation and management in California and the United States. Discussion on the key concepts and principles of state, federal and interstate water quantity and quality control; focusing on issues and problems, why conflicts occur and how solutions evolve. 3 lectures. Crosslisted as CRP/NR 408.

NR 412. Senior Assessment Project. 3 units

Term Typically Offered: F, SP

Prerequisite: NR 326 and completion of GE Area A3 with a grade of C- or better.

Principles and practices of integrated sampling and inventory of natural resource values in terrestrial ecosystems, culminating in a student project report. 2 lectures, 1 laboratory.

NR 414. Sustainable Forest Management. 4 units

Term Typically Offered: W

Prerequisite: NR 326, NR 365.

Biophysical, economic, social and political influences on optimal forest management for purposes of providing sustained yields of goods and services. Growth and yield modeling; forest investment analysis; sustainable forest production; harvest schedule modeling. Day field trip required. 3 lectures, 1 laboratory.

NR 416. Environmental Impact Analysis and Management. 4 units

Term Typically Offered: F, W, SP

Prerequisite: BIO 263 or NR 306.

National Environmental Policy and California Environmental Quality Acts as applied to environmental and natural resource management problems and projects. Intent, purpose and history of the laws; differences between laws identified. Request for proposals and preparation of environmental assessment documents covered. 3 lectures, 1 laboratory.

NR 418. Applied GIS. 3 units

Term Typically Offered: F, SP

Prerequisite: NR/LA 218.

Acquisition, organization and analysis of spatial data from diverse sources using Geographic Information System (GIS) software. GIS modeling applications and validation techniques used in development and preparation of client-driven projects. 1 lecture, 2 activities.

NR 420. Watershed Assessment and Protection. 4 units

Term Typically Offered: W

Prerequisite: NR 320; or graduate standing.

Analysis of streamflow, peak flows, and land management effects using established techniques and hydrologic models. Fluvial processes, sediment transport, and channel restoration techniques. Assessment and restoration of watersheds toward protection of aquatic and public resources. Weekend field trips required. 3 lectures, 1 laboratory.

NR 421. Wetlands. 4 units

Term Typically Offered: W

Prerequisite: BOT 121 or BIO 162, CHEM 111 or CHEM 127, and SS 121 or SS 131. Recommended: one of the following: BIO 327, BOT 313, BOT 326, MSCI 328 or NR 306.

The formation, characteristics, and functions of wetlands. Genesis of hydric soils. Plant adaptations to saturated soils. Wetlands as wildlife habitat. Policies and social issues associated with wetlands. The procedures of wetland delineations. 3 lectures, 1 laboratory. Crosslisted as BIO/NR/SS 421.

NR 425. Applied Resource Analysis and Assessment. 4 units

Term Typically Offered: F, W, SP

Prerequisite: NR 416.

Environmental impacts in responses to resource management, projects, programs and activities. Preparation, implementation, and coordination of environmental plans. Criteria for measurements, interpretation, and evaluation. Resource inventories, analysis, evaluation, synthesis, environmental assessment writing and preparation. 3 lectures, 1 laboratory.

NR 434. Wood Properties, Products and Sustainable Uses. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area B.

Principles of wood properties, green building practices, sustainable and efficient use of renewable wood resources including methods for using wood as an energy source. Field trips required. 3 lectures, 1 laboratory.

NR 435. Environmental Policy Analysis. 4 units

Term Typically Offered: SP

Prerequisite: NR 326. Recommended: NR 335.

Policy process approach to understanding the efforts to resolve natural resource problems in the public and private sector. Principles and techniques used to analyze the effects of environmental policies. Analysis of major federal and state environmental laws. 4 lectures.

NR 455. Wildland-Urban Fire Protection. 4 units

Term Typically Offered: W

Prerequisite: NR 340.

Biophysical and socioeconomic issues affecting wildland fire management in urbanized landscapes. Fire risk assessment. Pre-fire prevention, mitigation, and preparedness, during-fire response, and post-fire recovery actions by public- and private-sector agencies and residents. 3 lectures, 1 laboratory.

NR 465. Ecosystem Management. 4 units

Term Typically Offered: SP

Prerequisite: NR 326 and NR 416.

Capstone course that integrates biophysical, economic and socio-political sciences. Principles, concepts and techniques designed to utilize resources while sustaining ecosystem health within acceptable limits of change. Ecosystem assessment, planning, management and monitoring project. 3 lectures, 1 laboratory.

NR 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

NR 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

NR 472. Leadership Practice. 1 unit

Term Typically Offered: W

Prerequisite: Junior standing.

Tasks associated with development of personal leadership skills. Study and practice in setting goals and objectives; developing, evaluating and implementing a project independently and as part of a team; decision making and problem-solving emphasized. Total credit limited to 4 units. 1 laboratory. Crosslisted as NR/RPTA 472.

NR 475. Sustainable Forest and Environmental Practices. 12 units

Term Typically Offered: SU

Prerequisite: Completion of GE Area B and consent of instructor.

Recommended: Junior or senior standing.

Typical modules related to sustainable forest management, ecosystem sampling and inventory methods, photo interpretation, hydrologic resources, road condition, project impact analysis, best management practices. Topics covered vary from term to term depending on the priority for learning modules. Residency at Swanton Pacific and extended field trips required. 8 lectures, 4 activities. Crosslisted as HNRS/NR 475.

NR 476. Senior Project - Advanced Internship Experience in Environmental Science/Management. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Completion of GE Area A with a grade of C- or better; and ERSC 363 or NR 306 or NR 326.

Independent internship experience conducted under faculty supervision focusing on a discipline area of environmental science/management. Completion of a project as a component of their internship. Satisfies the senior project requirement. Minimum 90 hours required. Crosslisted as ERSC/NR 476.

NR 477. Senior Project - Research Experience in Environmental Science. 3 units

Term Typically Offered: W

Prerequisite: Completion of GE Area A with a grade of C- or better; and ERSC 363 or NR 306 or NR 326.

Guided research experience in a specific area of environmental science. Implementation of materials and methods. Collection, analysis and interpretation of data. Completion of formal written report. Satisfies senior project requirement. 1 lecture, 2 laboratories. Crosslisted as ERSC/NR 477.

NR 478. Senior Project - Current Topics in Environmental Science/Management. 3 units

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better; and ERSC 363 or NR 306 or NR 326.

Critical evaluation and formal presentation of current issues in environmental science/management. Evaluation of current topics, analysis of supporting evidence, and synthesis and presentation of resulting perspectives on different approaches to current challenges in environmental science/management. Satisfies the senior project requirement. 3 lectures. Crosslisted as ERSC/NR 478.

NR 479. Senior Project - Independent Study. 3 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Completion of GE Area A with a grade of C- or better; ERSC 363 or NR 306 or NR 326; and consent of instructor.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 90 hours total time. Crosslisted as ERSC/NR 479.

NR 500. Individual Study. 1-3 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Advanced independent study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units.

NR 503. Tropical Forest Ecosystem. 3 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Tropical forest ecosystem classification, function and limitations. Applied tropical forest management systems; tropical problems, management, and political strategies; over-grazing and desertification; overcutting and fuelwood shortages. 3 seminars.

NR 532. Applications in Biometrics and Econometrics. 4 units

Term Typically Offered: F

Prerequisite: One course in undergraduate statistics, graduate standing, or consent of instructor.

Parametric and semi-parametric statistical methods in modeling biological and economic phenomena. Biometric modeling of stand growth and inventory. Econometric modeling of market and environmental values. 3 lectures, 1 laboratory.

NR 534. Environmental Modeling. 3 units

Term Typically Offered: W

Prerequisite: One course in statistics or graduate standing.

Methods and modeling approaches used in quantifying ecological and environmental processes and conditions, such as fire behavior, wildland hydrology, terrestrial and aquatic habitat condition, using GIS and other models. 2 lectures, 1 laboratory.

NR 539. Graduate Internship in Forest Resources. 1-9 units

Term Typically Offered: TBD

Prerequisite: Consent of internship instructor.

Application of theory to the solution of problems of forest resources or related businesses in the field. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty advisor before the internship commences. Degree credit limited to 6 units.

NR 570. Selected Topics in Forest Resources. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1-4 seminars.

NR 571. Selected Topics Forest Resources Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory of selected topics for advanced students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1-4 laboratories.

NR 575. Applications in Advanced Watershed Hydrology. 2 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor. Recommended: NR 420.

Techniques and applications in watershed hydrology to real-world projects. Projects could include water quality or quantity assessments, water quality or channel morphology monitoring, and structural and non-structural enhancements for channel and upland watersheds, culminating in a final report and presentation. 2 laboratories.

NR 581. Graduate Seminar in Environmental Sciences. 3 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Student study and presentation of selected developments, trends and problems in the field of forest and natural resources, earth and soil sciences, and environmental management. 3 seminars. Crosslisted as NR/SS 581.

NR 599. Thesis. 1-9 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Individual research in forest or natural resources management under the general supervision of faculty, leading to a graduate thesis. Degree credit limited to 9 units.

Philosophy (PHIL)

PHIL Courses

PHIL 101. Introduction to Philosophy. 4 units

Term Typically Offered: F

Foundational methods and central issues in contemporary philosophy including logic, epistemology, metaphysics and ethics. Required of all philosophy majors. Open to all majors and philosophy minors. 4 lectures. NOTE: This is not a GE course and will not count for GE credit.

PHIL 126. Logic and Argumentative Writing. 4 units

GE Area A3

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A1 with a grade of C- or better.

Principles of argument analysis, evaluation and construction. Deductive and inductive reasoning, including analogical arguments, universal and statistical generalizations, and causal inferences. Principles of organizing and writing argumentative essays. Moral dimensions of rational discourse. 4 lectures. Fulfills GE A3; for students admitted Fall 2016 or later a grade of C- or better is required to fulfill GE Area A3.

PHIL 230. Philosophical Classics: Knowledge and Reality. 4 units

GE Area C2

Term Typically Offered: F,W,SP,SU

Prerequisite: Completion of GE Area A with a grade of C- or better; or for PHIL majors GE Area A3 with a grade of C- or better. Recommended: PHIL 126.

Critical examination of primary philosophical texts, from the ancient and modern periods, with focus on the nature of reality and the sources and limits of human knowledge. 4 lectures. Crosslisted as HNRS/PHIL 230. Fulfills GE C2.

PHIL 231. Philosophical Classics: Ethics and Political Philosophy. 4 units
GE Area C2

Term Typically Offered: F,W,SP,SU

Prerequisite: Completion of GE Area A with a grade of C- or better; or for PHIL majors GE Area A3 with a grade of C- or better. Recommended: PHIL 126.

Readings from primary philosophical texts, from the ancient and modern periods, with focus on the identification, evaluation and contemporary relevance of the central ethical and political themes and arguments presented in them. Course may be offered in classroom-based or online format. 4 lectures. Crosslisted as HNRS/PHIL 231. Fulfills GE C2.

PHIL 241. Symbolic Logic. 4 units

Term Typically Offered: F, SP

Prerequisite: Completion of GE Area A3 with a grade of C- or better.

The nature of deductive logical systems. Methods of notation, translation and proof in sentential and predicate calculi including truth-trees and natural deduction systems. Introduction to meta-theory. 4 lectures.

PHIL 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

PHIL 285. Ethics Bowl. 4 units

Term Typically Offered: F

Prerequisite: One of the following: PHIL 231, PHIL 331, PHIL 332, PHIL 333, PHIL 334, PHIL 335, PHIL 336, PHIL 337, PHIL 339, PHIL 340, PHIL 341 or PHIL 439; and completion of GE area A with a grade of C- or better.

Preparation for competition in the Intercollegiate Ethics Bowl. Rules and format of competition, analysis and preparation of cases specific to the current year's competition. Coverage of ethical theory relevant to current cases. Field trips required. 4 lectures.

PHIL 309. Early Greek Philosophy through Plato. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Beginnings of Western philosophy and science in Ancient Greece. The Presocratics, Socrates, and Plato. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 310. Aristotle and Hellenistic Philosophy. 4 units

GE Area C4

Term Typically Offered: F

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Development of Western philosophy and science in the Hellenistic and Roman periods. Aristotle, Epicureanism, Stoicism, Skepticism. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 312. Medieval Philosophy. 4 units

GE Area C4

Term Typically Offered: F

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Development of Western philosophy from Augustine to Ockham, including Anselm, Abelard, Roger Bacon, Bonaventure, Aquinas, and Duns Scotus. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 313. Early Modern Rationalism. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Development of Western philosophy from the late Renaissance through Leibniz, with special emphasis upon the epistemology and metaphysics of the Continental Rationalists. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 314. Early Modern Empiricism. 4 units

GE Area C4

Term Typically Offered: SP

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Development of Western philosophy from the Renaissance through Mill, with special emphasis on British Empiricism. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 315. Kant and 19th Century European Philosophy. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Primary issues and concepts found in German philosophy from 1780 to 1900, with emphasis on Kant, Hegel, and Nietzsche. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 317. History of Analytic Philosophy. 4 units

GE Area C4

Term Typically Offered: F

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Major developments within 20th century British and American philosophy, with focus chiefly around Analytic philosophy. Other schools, such as Pragmatism, may be included, as may some philosophers outside of Britain and America whose work was influential in those countries. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 318. Phenomenology. 4 units

GE Area C4

Term Typically Offered: SP

Prerequisite: Junior standing or Philosophy major; completion of GE area A with a grade of C- or better; and GE Area C2.

Methods and uses of phenomenological analysis through study of 20th century philosophers and contemporary applications. Topics include phenomenological method, perception, meaning, and the role of experience in philosophical inquiry. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 319. Existentialism. 4 units

GE Area C4

Term Typically Offered: SP

Prerequisite: Junior standing or Philosophy major; completion of GE area A with a grade of C- or better; and GE Area C2.

Major existentialist philosophers of the 19th and 20th century such as Kierkegaard, Nietzsche, Heidegger, Sartre, de Beauvoir, Merleau-Ponty, and Marcel. Existentialist themes in historical or contemporary context. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 320. Asian Philosophy. 4 units

GE Area C4

Term Typically Offered: TBD

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Philosophies developed in India, South Asia, China and Japan, including the logical and epistemological presuppositions of the Six Schools of Hindu metaphysics, Buddhist philosophy, Confucian moral philosophy, Taoist metaphysics and social ecology. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 321. Philosophy of Science. 4 units

GE Area C4

Term Typically Offered: F, SP

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

The rational foundations of inquiry and explanation in the physical, biological and social sciences. Justification of scientific claims, the difference between science and pseudoscience, the relationship between science and other fields of investigation. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 322. Philosophy of Technology. 4 units

GE Area C4

Term Typically Offered: F

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Analyses of the philosophical foundations and implications of technology. Technology and the human condition, technology and philosophical ethics, technology and political philosophy, technology and the metaphysics of human nature, and the relationship between science and technology. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 323. Ethics, Science and Technology. 4 units

GE Area C4

Term Typically Offered: F, SP

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Ethical decision-making as applied to issues such as the use of robots, the treatment of animals, sustainability, scientific fraud, feminist analysis of science and technology, as well as questions about whether technology is just a value-neutral tool or, rather, embodies certain values. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 327. Robot Ethics. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Introduction, short history, and overview of robot (meta)ethics, with applied ethics issues to include programming, environment, military uses, sex, legal implications, risk, liability, diversity, sustainability, healthcare, education, religion, and the home. Finally, future issues of robot rights and personhood. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 328. Technologies and Ethics of Warfare. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2. 4 lectures.

Ethics of killing in warfare, including requirements of justice in declaring and waging war. Topics include terrorism, remotely piloted aircraft ('drones'), autonomous weapons ('killer robots'), cyber warfare, nuclear war, city bombing, and humanitarian intervention. Fulfills GE C4 except for Philosophy majors.

PHIL 331. Ethics. 4 units

GE Area C4

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Analyses of various traditional and contemporary positions on the difference between right and wrong, if there is one. Theories of metaethics and normative ethics including the divine command theory, relativism, intuitionism, noncognitivism, virtue ethics, egoism, utilitarianism and duty-based ethics. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 332. History of Ethics. 4 units

GE Area C4

Term Typically Offered: TBD

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

The history of moral thought from Homer and the Pre-Socratics to the 20th century, and focus on theories of moral goodness and rightness of action. Related issues and areas of thought, e.g. metaphysics, theology, science, politics, psychology freedom/determinism to be considered, where they shed light on moral thought. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 333. Political Philosophy. 4 units

GE Area C4

Term Typically Offered: SP

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Analyses of the philosophical foundations of political ideologies, including theories of political authority, legitimacy, obligation, and rights, and of the proper function of the state, and the relation of these theories to issues in meta-physics, theory of knowledge, and ethics. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 334. Philosophy of Law. 4 units

GE Area C4

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or Philosophy major; completion of GE Areas A with a grade of C- or better; and GE Area C2.

Normative and analytic questions about law. Nature of law and legal systems. Justification of law. Moral obligation to obey the law. Nature and justification of punishment. Guilt and legal responsibility. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 335. Social Ethics. 4 units

GE Area C4; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Examination of contemporary moral problems, solutions to these problems, and the arguments for these solutions, with emphasis on two or more of the following sample problem areas: abortion, suicide and euthanasia, capital punishment, family ethics, race relations, social justice, war, women's issues. 4 lectures. Crosslisted as PHIL 335/HNRS 336. Fulfills GE C4 except for Philosophy majors. Fulfills USCP.

PHIL 336. Feminist Ethics, Gender, Sexuality and Society. 4 units

GE Area C4; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Critical examination of the relations between gender, sexuality, ethnicity, society and ethics from feminist perspectives, with special attention paid to problems in contemporary applied ethics. Joint focus on theory and application. 4 lectures. Crosslisted as PHIL/WGS 336. Fulfills GE C4 except for Philosophy majors. Fulfills USCP.

PHIL 337. Business Ethics. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Critical examination of ethical problems that arise in business. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 339. Biomedical Ethics. 4 units

GE Area C4

Term Typically Offered: F, SP

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Critical examination of problems in biomedical ethics, proposed solutions to these problems, and the arguments for such solutions. Emphasis on two or more of the following sample problem areas: concepts of health and disease, human experimentation, informed consent, behavior control, genetic intervention, new birth technologies, euthanasia and physician-assisted dying. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 340. Environmental Ethics. 4 units

GE Area C4

Term Typically Offered: SP

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Analyses of various positions on the moral status of nonhuman entities and problems such as the treatment of animals, wilderness preservation, population, pollution and global warming. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 341. Professional Ethics. 4 units

GE Area C4

Term Typically Offered: SP

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Moral problems as they arise in professions such as law, medicine, engineering, research and education: deception, paternalism, confidentiality, discrimination and others. Consideration of various professional codes of ethics. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 342. Philosophy of Religion. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Inquiry into the rational and nonrational bases of religious claims. Arguments for and against the existence of God. Discussion of miracles, revelation, the definition of God, the problem of evil, the relation of faith and reason, the nature of religious experience, the verification of religious claims. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 343. Continental Political Philosophy. 4 units

GE Area C4

Term Typically Offered: TBD

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Analysis of political thought in major movements in 20th- and 21st-century European philosophy, such as deconstruction, existentialism, and phenomenology. Emphasis on political issues, such as cultural membership, exclusion, structural injustice, secularism, and the political impact of technology. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 350. Aesthetics. 4 units

GE Area C4

Term Typically Offered: TBD

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Critical examination of philosophical views of art from both a historical and contemporary perspective. Treatment of theories from Plato and Aristotle through those of the twentieth century. Discussion of the problems raised by modern art. The relation between aesthetic values and metaphysics, epistemology, ethics and politics. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 351. Philosophy of Literature. 4 units

GE Area C4

Term Typically Offered: TBD

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Areas C1 and C2.

Analysis of philosophical issues related to literature such as interpretation, authorial intention, linguistic expression, ethical responsibilities of writers and readers, and use of literary styles by philosophers. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 369. Postmodernism. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Primary issues and developments in European philosophy in the second half of the 20th century. Examination of the influence of postmodern philosophy in areas such as art, literature, architecture, culture studies, philosophy of language, and philosophy of religion. 4 lectures. Fulfills GE C4 except for Philosophy majors.

PHIL 385. Advanced Ethics Bowl. 2 units

CR/NC

Term Typically Offered: F, W

Prerequisite: PHIL 285.

Preparation for ongoing participation in Intercollegiate Ethics Bowl competitions. Preparation and discussion of current competition cases, development of research and presentation skills, and participation in competition. Field trips required. 2 lectures. Total credit limited to 6 units. Credit/No Credit grading only.

PHIL 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

PHIL 411. Metaphysics. 4 units

Term Typically Offered: F, SP

Prerequisite: Junior standing and completion of GE Area C2.

Traditional and current ideas and arguments about substance, the relation of universals to particulars, space and time, events, causation and necessity, the self and free will. 4 lectures.

PHIL 412. Epistemology. 4 units

Term Typically Offered: W

Prerequisite: Junior standing and completion of GE Area C2.

Analysis of the concept of knowledge. Development of competing theories of epistemic justification and truth. Inquiry into relationship between knowledge, belief, justification and truth. Examination of skepticism. 4 lectures.

PHIL 421. Philosophy of Space, Time and Matter. 4 units

Term Typically Offered: W

Prerequisite: Junior standing and completion of GE Area C2.

Investigation of the philosophical foundations and interpretation of relativity theory and elementary quantum mechanics. Emphasis on philosophical issues relevant to contemporary philosophy of science such as scientific realism. Some discussion of very recent theories of space, time, and matter. 4 lectures.

PHIL 422. Philosophy of Mind. 4 units

Term Typically Offered: F

Prerequisite: Junior standing and completion of GE Area C2.

Classic and current work in the problems and issues of the nature and unity of the self, consciousness, mental representations, and action, and of the relation of philosophy of mind to psychology, linguistics and computer science. 4 lectures.

PHIL 423. Philosophy of Language. 4 units

Term Typically Offered: W

Prerequisite: Junior standing and completion of GE Area C2.

Traditional and contemporary philosophical issues that arise from the structure of language. Relevant concepts include: syntax, semantics, pragmatics, meaning, reference, truth, identity, thought, reality. Important distinctions: use/ mention, relations/properties of relations, sentences/statements/-propositions. 4 lectures.

PHIL 429. Special Topics in the History of Philosophy. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing and completion of GE Area C2.

Advanced discussion of selected topics in the history of philosophy. Examination and analysis of important philosophical movements (e.g., positivism, postmodernism) or alternatively, of particular philosophers or philosophical works of exceptional importance (e.g., David Hume; Kant's Critique of Pure Reason). The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures.

PHIL 439. Selected Problems in Ethics and Political Philosophy. 4 units

Term Typically Offered: F, SP

Prerequisite: Junior standing and completion of GE Area C2.

Advanced discussion of selected topics in ethics and political philosophy. Examination and analysis of significant ethical or political theories (e.g., utilitarianism, contractarianism) or alternatively, of particular philosophers or philosophical works of exceptional importance (e.g., John Stuart Mill; John Rawls' A Theory of Justice). The Class Schedule will list topic selected. Total credit limited to 12 units. 4 lectures.

PHIL 449. Selected Topics in Recent Philosophy. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area C2.

Advanced discussion of selected topics in recent philosophy. Examination and analysis of important recent movements in central philosophical areas (e.g., metaphysics, epistemology, philosophy of science, philosophy of language, philosophy of mind) or, alternatively, of particular philosophers or philosophical works of exceptional recent importance. The Schedule of Classes will list topic selected. Total credit limited to 12 units credit; may be repeated in same term. 4 lectures.

PHIL 451. Ethics in the Sciences. 3 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

The practice, performance and application of science from the standpoint of ethics. Includes issues involving plagiarism, data handling, fraud, safety and selected applications in specific science careers. Models for the analysis and resolution of ethical dilemmas are presented. 3 seminars. Crosslisted as PHIL/SCM 451.

PHIL 460. Senior Project I. 2 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: PHIL 225 or PHIL 241, senior standing, and consent of instructor; Philosophy majors only.

Selection, development and completion of a project under faculty supervision. Results presented in a formal thesis. Minimum of 60 hours per quarter. PHIL 460 is graded on a CR/NC basis.

PHIL 461. Senior Project II. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: PHIL 460; student must also receive a passing score on the senior examination in order to enroll in PHIL 461; Philosophy majors only.

Selection, development and completion of a project under faculty supervision. Results presented in a formal thesis. Minimum of 60 hours per quarter. Work in PHIL 461 is given a letter grade.

PHIL 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Class Schedule will list topics selected. Total credit limited to 8 units. 1-4 lectures.

Physical Education: Men (PEM)

PEM Courses

PEM 182. Baseball. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEM 183. Basketball. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEM 184. Cross Country. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEM 185. Football. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEM 189. Soccer. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEM 191. Swimming. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEM 192. Tennis. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEM 193. Track & Field. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEM 195. Golf. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEM 196. Wrestling. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

Physical Education: Women (PEW)

PEW Courses

PEW 183. Basketball. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEW 184. Cross Country. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEW 189. Soccer. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEW 190. Softball. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEW 191. Swimming. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEW 192. Tennis. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEW 193. Track and Field. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEW 194. Volleyball. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEW 195. Golf. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

PEW 196. Beach Volleyball. 2 units

CR/NC

Term Typically Offered: TBD

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

Physical Science (PSC)

PSC Courses

PSC 101. Matter and Energy. 4 units

GE Area B3; GE Area B4

Term Typically Offered: F, W, SP

Introduction to the basic principles of physical science, including observation, description, modeling, and the application of physical phenomena. Emphasis on interactions as described by energy, forces, and fields for mechanical, thermal, electric, and magnetic systems. 3 lectures, 1 laboratory. Fulfills GE B3 & B4.

PSC 102. Atoms and Molecules. 4 units

Term Typically Offered: W

Prerequisite: PHYS 121 or PHYS 131 or PHYS 141 or PSC 101.

Introduction to the basic principles of physical science (observation, description, modeling of physical phenomena) with an emphasis on interactions at the molecular level. Interactions and the behavior of gases, physical change, and chemical change (including chemical reactions, chemical bonding, and solutions). 3 lectures, 1 laboratory.

PSC 103. The Physical Environment: Earth. 4 units

Term Typically Offered: SP

Prerequisite: PSC 101 or PHYS 121 or PHYS 131 or PHYS 141.

Recommended: PSC 102.

Introduction to the basic principles of the earth sciences, and applications of these principles in modern society. Structure and formation of the Earth, earthquakes, weather, and oceanography. 3 lectures, 1 laboratory.

PSC 201. Physical Oceanography. 4 units

GE Area B5

Term Typically Offered: F, W, SP

Introduction to the motions of the ocean. Physical environment and sea floor features; seawater properties; atmosphere and ocean interactions; ocean currents and circulation; waves and tides; El Nino; coastal ocean processes; climate change and ocean stressors; ocean resources and marine life. 4 lectures. Fulfills GE B5.

PSC 307. Nuclear Weapons in the Post-9/11 World. 4 units

GE Area F

Term Typically Offered: SP

Prerequisite: Junior standing and completion of GE Area B.

Technology and basic science of fission/fusion weapons, uranium/plutonium, nuclear reactors, offensive/defensive missile systems, command/ control, verification, weapon effects, nuclear testing. Historical context of Cold War and proliferation, recent events, global norms, arms control treaties. 3 lectures, 1 seminar. Fulfills GE Area F.

PSC 320. Energy, Society and the Environment. 4 units

GE Area F

Term Typically Offered: W

Prerequisite: Junior standing and completion of GE Area B.

Science and technology of current and future energy sources along with associated environmental problems and societal response. Energy production, consumption, efficient usage, fossil fuels, nuclear, solar, other renewables. Risks, benefits, planning, economics. 3 lectures, 1 activity. Fulfills GE Area F.

PSC 391. Appropriate Technology for the World's People: Development. 4 units

GE Area D5

Term Typically Offered: F

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and two courses from GE D1-D4.

A broad overview of international development and appropriate design for sustainability. Besides traditional classroom work, students work in teams to address problems with technical solutions. Collaboration with mentors from the university, private sector, and nonprofits serves to provide diverse background and project mentorship. 4 lectures. Crosslisted as HNRS/PSC/UNIV 391. Fulfills GE D5.

PSC 392. Appropriate Technology for the World's People: Design. 4 units

GE Area F

Term Typically Offered: SP

Prerequisite: Junior standing and completion of GE Area B, or graduate standing. Recommended: UNIV 391, GE Area D2, and GE Area D3.

Addresses the needs of international impoverished communities with technological solutions, which are inexpensive, ecologically sustainable, and socially appropriate. Group study of target communities, and design and construction of an appropriate technology prototype. Not open to students with credit in PSC/UNIV/HNRS 492. 3 lectures, 1 laboratory. Crosslisted as HNRS/PSC/UNIV 392. Fulfills GE Area F.

PSC 424. Organizing and Teaching Science. 4 units

Term Typically Offered: F

Prerequisite: Admission to the Single Subject Credential Program.

Techniques, aims and objectives in the teaching of physical and life sciences at the secondary level. Selection and organization of teaching material, including strategies for English language learners (ELL) and special needs students. Evaluation of results. 3 lectures, 1 activity. Crosslisted as BIO/PSC 424.

PSC 425. Clinical Experience in Teaching Science Seminar. 2 units

CR/NC

Term Typically Offered: W, SP

Prerequisite: Acceptance into the Single Subject Credential Program in Science. Concurrent: EDUC 469 or EDUC 479.

Principles and practices in effective teaching of science at the middle and high school level, learning theories, curriculum content and structure, classroom issues, and the teaching profession. Credit/No Credit grading only. Total credit limited to 4 units. 2 seminars. Crosslisted as BIO/PSC 425.

PSC 491. Appropriate Technology for the World's People: Development. 4 units

Term Typically Offered: F

Prerequisite: Consent of instructor, and senior or graduate standing.

Corequisite: GE Area D5.

A broad overview of international development and appropriate design for sustainability. Besides traditional classroom work, students work in teams to address problems with technical solutions. Collaboration with mentors from the university, private sector, and nonprofits serves to provide diverse background and mentorship. Seminar paper required. Not open to students with credit in PSC/UNIV/HNRS 391. 4 lectures. Crosslisted as PSC/UNIV 491.

PSC 492. Appropriate Technology for the World's People: Design. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing and completion of GE Area B, or graduate standing. Recommended: UNIV 391, GE Area D2, and GE Area D3.

Addresses the needs of international impoverished communities with technological solutions, which are inexpensive, ecologically sustainable, and socially appropriate. Group study of target communities, and design and construction of an appropriate technology prototype. Seminar paper required. Not open to students with credit in PSC/UNIV/HNRS 392. 3 lectures, 1 laboratory. Crosslisted as PSC/UNIV 492.

Physics (PHYS)

PHYS Courses

PHYS 104. Introductory Physics. 4 units

GE Area B3

Term Typically Offered: F

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level.

Elementary introduction to mechanics, gases, liquids and solids, heat, vibrations and waves, light, electricity and magnetism. Intended to provide non-science students with an understanding of basic physical concepts. Not open to students who have credit in a college physics course. 4 lectures. Fulfills GE Area B3.

PHYS 107. Introduction to Meteorology. 4 units

GE Area B3

Term Typically Offered: TBD

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level.

Physics of Earth's atmosphere. Topics include the physical basis for temperature, wind generation, atmospheric circulation, humidity, adiabatic processes, cloud formation, cyclone development, precipitation, and storm growth. Other topics include the variety of storms and their effects, satellite imaging, and air pollution and its possible effect on global temperature change. 4 lectures. Fulfills GE Area B3.

PHYS 111. Contemporary Physics for Nonscientists. 4 units

GE Area B3

Term Typically Offered: F

Exploration of the key concepts of quantum mechanics and Einstein's special and general theories of relativity. Particle-wave duality, Heisenberg's uncertainty principle, Schrodinger's cat, warped spacetime, black holes. 4 lectures. Fulfills GE B3.

PHYS 121. College Physics I. 4 units

GE Area B3

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 118 and high school trigonometry, or MATH 119.

Introductory course in mechanics emphasizing motion, force, and energy. Not open to students having a grade of C- or better in PHYS 131 or PHYS 141. 4 lectures. Fulfills GE B3.

PHYS 122. College Physics II. 4 units

GE Area B3; GE Area B4

Term Typically Offered: F,W,SP,SU

Prerequisite: PHYS 118, PHYS 121, PHYS 131, or PHYS 141.

Continuation of PHYS 121. Topics include properties of materials, fluids, waves and vibrations, sound, heat, light and optics. Not open for credit to students having a grade of C- or better in PHYS 132. 3 lectures, 1 laboratory. Fulfills GE B3 & B4.

PHYS 123. College Physics III. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PHYS 118, PHYS 121, PHYS 131, or PHYS 141.

Recommended: PHYS 122.

Continuation of PHYS 121 and 122. Electrostatics, electric current, magnetic fields and induction. Elements of modern physics. Not open for credit to students having a grade of C- or better in PHYS 133. 3 lectures, 1 laboratory.

PHYS 125. College Physics I Laboratory. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of the College of Science and Mathematics

Advising Center. Co-requisite: PHYS 121.

Laboratory experiments to complement introductory course in mechanics, emphasizing experiments on motion, force, and energy. Not open to students with a grade of C- or better in PHYS 131 or PHYS 141. 1 laboratory.

PHYS 131. General Physics I. 4 units

GE Area B3; GE Area B4

Term Typically Offered: TBD

Prerequisite: MATH 141 with grade C- or better and MATH 142 or MATH 182 (or concurrent enrollment); for ME and AERO students only.

Recommended: High School Physics.

Fundamental principles of mechanics. Vectors, particle kinematics. Equilibrium of a rigid body. Work and energy, linear momentum, rotational kinematics and dynamics. Primarily for engineering students, and for students majoring in the physical sciences. Not open to students with credit in PHYS 141. 3 lectures, 1 laboratory. Crosslisted as HNRS/PHYS 131. Fulfills GE B3 & B4.

PHYS 132. General Physics II. 4 units

GE Area B3; GE Area B4

Term Typically Offered: F,W,SP,SU

Prerequisite: PHYS 131 or HNRS 131 or PHYS 141.

Oscillations, waves in elastic media, sound waves. Temperature, heat and the first law of thermodynamics. Kinetic theory of matter, second law of thermodynamics. Geometrical and physical optics. 3 lectures, 1 laboratory. Crosslisted as HNRS/PHYS 132. Fulfills GE B3 & B4.

PHYS 133. General Physics III. 4 units

GE Area B3; GE Area B4

Term Typically Offered: F,W,SP,SU

Prerequisite: PHYS 131 or HNRS 131 or PHYS 141, and MATH 142.

Recommended: MATH 241.

Charge and matter, electric field, electric potential, dielectrics, capacitance, current and resistance, electromotive force and circuits, magnetic fields, magnetic field of a moving charge, induced emf. 3 lectures, 1 laboratory. Fulfills GE B3 & B4.

PHYS 141. General Physics IA. 4 units

GE Area B3

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 141 with grade C- or better and MATH 142 or MATH 182 (or concurrent enrollment). Recommended: High School Physics.

Fundamental principles of mechanics. Vectors, particle kinematics. Equilibrium of a rigid body. Work and energy, linear momentum, rotational kinematics and dynamics. Primarily for engineering and science students. Not open to students with credit in PHYS 131. 4 lectures. Crosslisted as HNRS 134/PHYS 141. Fulfills GE B3.

PHYS 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

PHYS 202. Physics on the Computer. 4 units

Term Typically Offered: SP

Prerequisite: PHYS 133; and MATH 241 or MATH 244.

Introduction to using computers for solving problems in physics: differential equations, matrix manipulations, simulations and numerical techniques, nonlinear dynamics. 4 lectures.

PHYS 206. Experimental Physics. 4 units

Term Typically Offered: W

Prerequisite: PHYS 133 and MATH 143.

L-R-C circuits and electronic circuit elements emphasizing the applications of analog and digital electronics to instrumentation in modern physics. 3 lectures, 1 laboratory.

PHYS 211. Modern Physics I. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PHYS 132 and PHYS 133 and MATH 241. Recommended: MATH 242 or MATH 244.

Special relativity, fundamental principles of quantum mechanics, emphasizing the modern description of atomic phenomena. Wave-particle duality, Bohr theory, Schrodinger equation, elementary atomic structure. 4 lectures.

PHYS 212. Modern Physics II. 4 units

Term Typically Offered: SP

Prerequisite: PHYS 211.

Applications of quantum physics to atoms, molecules, solid state systems, nuclei, and elementary particles including angular momentum and spin. Topics may include applications of statistical mechanics, principles of the laser, cooling and trapping of atoms, Bose-Einstein condensates, semiconductors, superconductors, heavy ion physics, and other topics of current interest. 4 lectures.

PHYS 220. Introduction to Physics Research. 1 unit

CR/NC

Term Typically Offered: W

Prerequisite: PHYS 132 or PHYS 133.

Introduction to the research programs of faculty in the department and opportunities for research. Survey of departmental facilities and procedures related to research. Overview of external research programs/ internships. Credit/No Credit grading. 1 lecture.

PHYS 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

PHYS 301. Thermal Physics I. 4 units

Term Typically Offered: W

Prerequisite: PHYS 211.

Thermodynamics and statistical mechanics. Entropy, temperature, ensembles, partition functions, chemical potential, free energy. Selected applications including paramagnetism, ideal gas, Fermi-Dirac and Bose-Einstein distributions. 4 lectures.

PHYS 302. Classical Mechanics I. 4 units

Term Typically Offered: F

Prerequisite: PHYS 131 or PHYS 141; and MATH 241; and MATH 242 or MATH 244.

Laws of motion, kinematics and dynamics of a particle. Use of numerical methods for solving problems. Work and energy. Linear and angular momentum. Lagrange's and Hamilton's equations and the calculus of variations. Newton's Law of gravity, Kepler's laws of orbital motion, and central force problems. 4 lectures.

PHYS 303. Classical Mechanics II. 3 units

Term Typically Offered: W

Prerequisite: PHYS 302.

Mechanics in non-inertial reference frames. Dynamics of a rigid bodies. Coupled oscillators and normal modes. Use of numerical methods for solving problems. 3 lectures.

PHYS 310. Physics of Energy. 3 units

Term Typically Offered: SP

Prerequisite: PHYS 132.

Physics and mathematics applied to broad energy topics. Efficient usage, transportation, solar energy, nuclear fission and fusion. Plasma, hydrogen economy, fuel cells, wind wave, tidal, and geothermal energy. Transmission, storage, fossils. National planning, and energy economics. 3 lectures.

PHYS 313. Introduction to Atmospheric Physics. 3 units

Term Typically Offered: SP

Prerequisite: PHYS 132 or PHYS 122, and MATH 241. Recommended: MATH 304.

Properties of the atmosphere, atmospheric motions, solar and terrestrial radiation. Emphasis on conservation laws of momentum, energy and mass applied to understanding the Earth's atmospheric motions. 3 lectures.

PHYS 315. Introduction to Lasers and Laser Applications. 3 units

Term Typically Offered: SP

Prerequisite: PHYS 211 and MATH 143.

Interaction of radiation with matter, theory of laser action, characteristics and modification of laser output, types of lasers. Holography and other applications. 3 lectures.

PHYS 318. Special Theory of Relativity. 3 units

Term Typically Offered: W

Prerequisite: PHYS 211.

Fundamental experiments and basic postulates of special relativity. Simultaneity, length and time measurements. Lorentz transformations. Four-Vectors. Space-time diagrams. Relativistic mechanics and electromagnetism. 3 lectures. Formerly PHYS 317.

PHYS 322. Vibrations and Waves. 3 units

Term Typically Offered: F

Prerequisite: PHYS 132; and MATH 242 or MATH 244. Recommended: MATH 344.

Introduction to vibrations and waves and their applications. Harmonic oscillator, waves, complex notation, superposition, interference, coherence, Fourier analysis. Applications may include sound, optics, quantum mechanics, and electromagnetic radiation. 3 lectures.

PHYS 323. Optics. 4 units

Term Typically Offered: W

Prerequisite: MATH 241; and PHYS 133; and PHYS 322, EE 228, EE 201, or ME 318.

Geometrical optics, lens systems, aberrations, physical optics and polarization. 3 lectures, 1 laboratory.

PHYS 330. Teaching Physics. 4 units

Term Typically Offered: SP

Prerequisite: one of the following: PHYS 122, PHYS 123, PHYS 132, PHYS 133, PSC 102, or PSC 103.

Inquiry approaches to teaching physics incorporating insights from physics education research and the use of computer technology. Emphasis on pedagogical approaches and assessment that engage learners in scientific discourse and the development of basic models of physics phenomena such as motion, forces, energy, and momentum through experimentation. 2 lectures, 2 activities.

PHYS 340. Quantum Physics Laboratory I. 2 units

Term Typically Offered: F

Prerequisite: PHYS 206; PHYS 212; and one of the following: PHYS 202, CSC 101, CSC 231, or CSC 234.

Experimental studies of the quantum properties of atoms and nuclei. Measurements of fundamental constants. Statistics and data analysis. 1 lecture, 1 laboratory.

PHYS 341. Quantum Physics Laboratory II. 2 units

Term Typically Offered: W

Prerequisite: PHYS 340.

Experimental studies of quantum properties of atoms and nuclei. Interactions of radiation, particles and fields. 2 laboratories.

PHYS 342. Quantum Physics Laboratory III. 1 unit

Term Typically Offered: SP

Prerequisite: PHYS 341.

Advanced experimental studies of quantum properties of atoms and nuclei. Interactions of radiation, particles and fields emphasizing spectroscopic techniques. 1 laboratory.

PHYS 357. Advanced Instrumentation in Experimental Physics. 3 units

Term Typically Offered: SP

Prerequisite: PHYS 206.

Advanced analog and digital electronics, computer interfacing to experiments, robotics. 2 lectures, 1 laboratory.

PHYS 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigations, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

PHYS 401. Thermal Physics II. 3 units

Term Typically Offered: SP

Prerequisite: PHYS 301.

Additional topics in thermodynamics and statistical physics, including chemical equilibrium, phase transitions, transport processes, and cryogenics. 3 lectures.

PHYS 403. Particle and Nuclear Physics. 3 units

Term Typically Offered: SP

Prerequisite: PHYS 212 and PHYS 405.

Elementary particles and their interactions, fundamental forces, the Standard Model of particle physics. Symmetries and conservation laws including parity, charge conjugation, and time reversal invariance, as well as charge-parity violation. Dirac equation, quantum electrodynamics, and Feynman diagrams. Advanced nuclear physics. Topics may include decays, symmetries of the quark model, neutrinos, nucleosynthesis, and the quark-gluon plasma. 3 lectures.

PHYS 404. Research Experience for Advanced Undergraduates. 1-2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigations, research, studies, or surveys of selected problems. Credit/No Credit grading only. Total credit limited to 4 units, with a maximum of 2 units per quarter.

PHYS 405. Quantum Mechanics I. 4 units

Term Typically Offered: SP

Prerequisite: PHYS 212; PHYS 302; PHYS 322; MATH 241; and MATH 242 or MATH 244. Recommended: MATH 344.

Wave nature of matter and the basic postulates of quantum mechanics. The wave function, operators, and their interpretation. Schrodinger's equation and its solutions in one and more dimensions. The hydrogen atom and the periodic table. 4 lectures.

PHYS 406. Quantum Mechanics II. 3 units

Term Typically Offered: F

Prerequisite: PHYS 405.

Angular momentum operators and problems in three dimensions including the hydrogen atom. Elements of matrix mechanics and properties of spin state vectors. Time-independent and time-dependent perturbation theory. Topics may include variational principle, WKB approximation. 3 lectures.

PHYS 408. Electromagnetic Fields and Waves I. 4 units

Term Typically Offered: F

Prerequisite: PHYS 133 and MATH 304.

Electric and magnetic field theory using vector analysis. Electric fields, dielectric materials, magnetic fields, induced emf, magnetic materials, Maxwell's equations, wave equation. 4 lectures.

PHYS 409. Electromagnetic Fields and Waves II. 3 units

Term Typically Offered: W

Prerequisite: PHYS 408. Recommended: PHYS 322.

Wave equation, plane electromagnetic waves, guided waves. Dipole radiation, radiation from an accelerated charge. Special relativity. 3 lectures.

PHYS 410. Physics of Solid Earth. 3 units

Term Typically Offered: W

Prerequisite: PHYS 133, MATH 241 and MATH 244.

Gravity and the figure of the Earth. Body wave seismology, structure and composition of the Earth, heat flow and heat sources, Earth tides, rotational dynamics, the geomagnetic field and its source, paleomagnetism. 3 lectures.

PHYS 412. Solid State Physics. 3 units

GE Area B6

Term Typically Offered: F

Prerequisite: PHYS 211 and MATH 244.

Physics of solids including the structural, mechanical, thermal, and electronic properties, energy band theory and the properties of metals and semiconductors. 3 lectures. Fulfills GE B6 with PHYS 452.

PHYS 413. Advanced Topics in Solid State Physics. 3 units

Term Typically Offered: SP

Prerequisite: PHYS 412.

Semiconducting devices, including junction and field-effect transistors, LED's, and diode lasers. Magnetic properties of solids. Superconductivity, including discussion of high-temperature superconductors. Other topics of current interest in solid state physics. 3 lectures.

PHYS 417. Nonlinear Dynamical Systems. 4 units

GE Area B6

Term Typically Offered: SP

Prerequisite: PHYS 132 or PHYS 122; and PHYS 133 or PHYS 123; and MATH 241; and MATH 242 or MATH 244. Recommended: Junior standing.

Analysis of linear and nonlinear dynamical systems with emphasis on geometrical methods and visualization techniques. Fixed points, phase plane analysis, bifurcations and limit cycles. Laboratory component includes data acquisition and analysis using computers, numerical simulations of dynamical systems, and analysis of discrete systems. 3 lectures, 1 laboratory. Fulfills GE B6.

PHYS 418. Introduction to General Relativity. 3 units

Term Typically Offered: SP

Prerequisite: PHYS 211; and PHYS 302.

Introduction to Einstein's theory of gravity: general relativity. Geometric description of special relativity as flat spacetime. Extension to curved spacetimes and description of gravity. Topics include solar system tests of relativity, black holes, gravitational waves, and applications to astronomy and cosmology. 3 lectures.

PHYS 422. Polymer Electronics Laboratory. 1 unit

Term Typically Offered: SP

Prerequisite: EE 347 or MATE 340 or CHEM 319 or PHYS 340.

Experimental procedures in polymer electronics. Investigation of the characteristics of a polymer electronic device. 1 laboratory. Crosslisted as EE/PHYS 422.

PHYS 423. Advanced Optics. 4 units

Term Typically Offered: SP

Prerequisite: PHYS 323.

Advanced topics of modern optics. May include: fiber optics, Fourier optics, quantum optics, lasers, holography, non-linear optics. 3 lectures, 1 laboratory.

PHYS 424. Theoretical Physics. 3 units

Term Typically Offered: SP

Prerequisite: MATH 304, MATH 344, and PHYS 133.

Contour integration in the complex plane, properties of common special functions and delta functions used in physics, partial differential equations, Green's function techniques for solving differential equations. 3 lectures.

PHYS 452. Solid State Physics Laboratory. 1 unit

GE Area B6

Term Typically Offered: SP

Prerequisite or concurrent: PHYS 412.

Selected experiments on X-ray diffraction, Hall effect, optical absorption, thermo-electric effect, photovoltaic cells, diode characteristics, and superconductivity. 1 laboratory. Fulfills GE B6 with PHYS 412.

PHYS 461. Senior Project I. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 60 hours total time.

PHYS 462. Senior Project II. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 60 hours total time.

PHYS 463. Senior Project - Laboratory Research I. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Selection and completion of a laboratory research project under faculty supervision. Projects typical of problems which graduates will encounter in industry or graduate school. Project results are presented in a formal report. Minimum 60 hours total time. 2 laboratories.

PHYS 464. Senior Project - Laboratory Research II. 2 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Selection and completion of a laboratory research project under faculty supervision. Projects typical of problems which graduates will encounter in industry or graduate school. Project results are presented in a formal report. Minimum 60 hours total time. 2 laboratories.

PHYS 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

PHYS 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

PHYS 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 12 units; major credit limited to 2 units. Credit/No Credit grading only.

PHYS 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Total credit limited to 12 units; major credit limited to 2 units. Credit/No Credit grading only.

Political Science (POLS)

POLS Courses

POLS 111. California Constitution and Government. 1 unit

Term Typically Offered: F, W, SP

Basic aspects of California state government. Satisfies GE D1 for students who have passed both AP US Government and US History exams, or transfer students who have received advice in writing from the Office of the Registrar to take POLS 111. Course may be offered in classroom-based or hybrid format. 1 lecture.

POLS 112. American and California Government. 4 units

GE Area D1

Term Typically Offered: F, W, SP

Study of governmental institutions, politics, issues and political behavior in the United States and California in constitutional, historical, social and cultural perspectives. Meets the U.S. government and California state/local government requirement. 4 lectures. Fulfills GE D1.

POLS 180. Political Inquiry. 4 units

Term Typically Offered: F, W

Introduction to the scope, language, concepts and approaches employed in political science and the social sciences. Includes emphasis on basic methodological and research strategies for assessing political issues, and an overview of the subfields of political science. 4 lectures.

POLS 225. Introduction to International Relations. 4 units

Term Typically Offered: F, W, SP

Introduction to the basic concepts, issues, and theories surrounding the study of international politics. Changes in the nature of conflict, power, and national interests in the post-Cold War era. Role of states, non-governmental actors, and international organizations in the global arena. 4 lectures.

POLS 229. Introduction to Comparative Politics. 4 units

Term Typically Offered: F, W, SP

Introduction to basic concepts, issues, methodology, and theories in comparative politics. Major issues/theories include electoral laws and party systems, parliamentary and presidential institutions, socialization, democratization, corporatism and pluralism, religious and cultural impacts on politics. Topics explored through politics of countries and regions throughout the world. 4 lectures.

POLS 230. Basic Concepts of Political Thought. 4 units

Term Typically Offered: F, W, SP

Introduction to political theory. Focuses on concepts like: authority, liberty, equality, law, justice, community, rights, citizenship, property, class conflict, and constitutionalism. Readings from major thinkers, such as Plato, Aristotle, Augustine, Aquinas, Machiavelli, Locke, Hobbes, Rousseau, Marx, Nietzsche, Rawls, and others. 4 lectures.

POLS 245. Judicial Process. 4 units

Term Typically Offered: F, SP

The nature of the legal system. Topics may include: private and public law, civil and criminal law, trial and appellate courts, criminal procedure, judges, attorneys, and juries. 4 lectures.

POLS 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

POLS 285. Model United Nations. 4 units

Term Typically Offered: F

Prerequisite: One course in POLS or consent of instructor.

Introduction to the United Nations and major issues that confront it. Preparation for participation in collegiate Model United Nations conferences. Rules of procedure and debate, preparation of country position papers, and resolution writing. 4 lectures.

POLS 295. Foundations of Mock Trial. 4 units

Term Typically Offered: F

Prerequisite: Completion of GE Area D1 and consent of instructor.

Introduction to evidence, trial procedure, objections, and witness examination. Preparation for intercollegiate mock trial competitions (held in winter and spring). Extensive hands-on experience in researching, preparing, and arguing a legal case. 4 lectures.

POLS 308. Political Violence and Conflict Resolution. 4 units

Term Typically Offered: W

Prerequisite: POLS 225 or POLS 229.

Causes, methods, and consequences of non-state groups that use violent means to pursue revolutionary, separatist, or ideological goals both domestically and internationally. Dynamics of ethnic conflict, terrorist movements, paramilitary groups, insurgencies, and narco-trafficking. Processes of conflict resolution in divided societies through military responses, negotiated settlements, democracy, and peacekeeping missions. 4 lectures.

POLS 310. The Politics of Race, Class, Gender and Sexuality. 4 units
USCP

Term Typically Offered: SP

Prerequisite: Completion of Area D1. Recommended: POLS 112.

The social construction of gender, race, ethnicity, class and sexuality as analytical concepts and social locations. Using a variety of sources - political essays, critical theory, and memoir - the course analyzes how gender, race, ethnicity, class, and sexuality are shaped by social, cultural, and political contexts. 4 lectures. Fulfills USCP.

POLS 315. The American Presidency. 4 units

Term Typically Offered: W

Prerequisite: Completion of Area D1. Recommended: POLS 112.

Nature and problems of contemporary presidential leadership emphasizing the impact of Congress, bureaucracy, public opinion, the courts, non-governmental factors, and the party system upon presidential power. 4 lectures.

POLS 316. Political Participation. 4 units

Term Typically Offered: F

Prerequisite: Completion of Area D1. Recommended: POLS 112.

Role of political participation as manifested through social, psychological, and institutional constraints. Analysis of consensus and conflict in present day political participation as reflected in electoral, protest, and related behavior. 4 lectures.

POLS 317. Campaigns and Elections. 4 units

Term Typically Offered: W

Prerequisite: Completion of Area D1. Recommended: POLS 112.

Focus on contemporary political campaigns and elections in the U.S. Campaign management, message development and delivery. Impact of political ideology, mass media, technology, pressure groups on electoral outcomes. 4 lectures.

POLS 319. United States Congress. 4 units

Term Typically Offered: SP

Prerequisite: Completion of Area D1. Recommended: POLS 112.

Congressional elections and their effects on congressional actions, including the organization, procedures and consequences of the legislative process in Congress. 4 lectures.

POLS 321. Comparative Political Culture. 4 units

Term Typically Offered: SP

Prerequisite: POLS 229.

Survey of major concepts and theories of political culture and relationships among culture, politics, and society. Cultural influences of Christianity, Confucianism, Islam, and contemporary democratic, civic culture. The role of political culture in the industrialization process and post-colonial and post-communist transitions. 4 lectures.

POLS 324. International Relations Theory. 4 units

Term Typically Offered: TBD

Prerequisite: POLS 225 or POLS 229.

Survey of theoretical approaches to the study of international political processes and issues, including foreign policies, global political issues, cooperation and conflict. Analyses of selected problems to elucidate differences between realist, liberal, socialist, constructivist, and other theories. 4 lectures.

POLS 325. Global Political Issues. 4 units

GE Area D5

Term Typically Offered: F, W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; completion of one lower-division Area D course.

Concepts and theories in international relations and contemporary global issues. Application of principles of international relations to political issues and subjects which affect our lives. 4 lectures. Fulfills GE D5 except for Political Science majors.

POLS 328. Politics of Developing Areas. 4 units

Term Typically Offered: W, SP

Prerequisite: POLS 225 or POLS 229.

A detailed survey of the domestic politics of developing countries from a comparative perspective. Assessment of theories of development with appropriate examples taken from particular areas and countries. Repeatable to 8 units with different subtitles (e.g., 'Latin America,' 'East Asia,' 'Africa'). The Schedule of Classes will list topic selected. 4 lectures.

POLS 329. Ancient and Medieval Political Thought. 4 units

Term Typically Offered: TBD

Prerequisite: POLS 230.

Political theory from ancient Greece, ancient Rome, and the Medieval period. Readings from major authors, such as Plato, Aristotle, Augustine, Aquinas, and others. 4 lectures.

POLS 330. Modern Political Thought. 4 units

Term Typically Offered: TBD

Prerequisite: POLS 230.

Theories of political participation and the relationship between the individual and the state as developed in the works of influential thinkers such as Locke, Rousseau, Mill and Marx. 4 lectures.

POLS 331. Contemporary Political Thought. 4 units

Term Typically Offered: TBD

Prerequisite: POLS 230.

Ideas of major contemporary political thinkers, such as Wolff, Singer, Rawls, Strauss, MacKinnon, Beauvoir, Dewey, Walzer and others in historical context, compared and contrasted. 4 lectures.

POLS 333. World Food Systems. 4 units

GE Area F

Term Typically Offered: F, SP

Prerequisite: Junior standing and completion of GE Area B.

Integrated, interdisciplinary study of the technologies of global food production, environmental and social issues related to the application of those technologies, and moral and ethical issues associated with global food production and distribution. Emphasis on the politics of change. 4 lectures. Crosslisted as POLS/UNIV 333. Fulfills GE Area F.

POLS 334. Jurisprudence. 4 units

Term Typically Offered: W, SP

Prerequisite: POLS 112 and POLS 230.

Normative and analytical problems concerning law. Nature of law and legal systems including liberty and justice. Topics may include the connection between law and morality, feminist and critical race perspectives, crime and punishment, and economic analysis of the law. 4 lectures.

POLS 337. U.S. and China in the Contemporary World. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of one lower-division Area D course.

Investigation of China's political history with close attention to past and present U.S.-China relations. Topics include the conflict over Taiwan, territorial disputes in the South China Sea, and ongoing economic cooperation and competition, concerning trade and debt. 4 lectures. Fulfills GE D5 except for Political Science majors.

POLS 338. Critical Issues in American Politics. 4 units

GE Area D5

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course from GE Area D1 (POLS 112 recommended).

Examination of significant social, legal, economic and political issues that face the country and how the basic institutions of government-national, state, local-are responding to them; assessment of policies to correct these problems. 4 lectures. Crosslisted as HNRS/POLS 338. Fulfills GE D5 except for Political Science majors.

POLS 339. Authoritarian and Democratic Rule. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; completion of one lower-division Area D course.

A comparative examination of governing institutions used throughout the world. Emphasis on the diversity of governmental designs found within both authoritarian and democratic regimes. 4 lectures. Fulfills GE D5 except for Political Science majors.

POLS 340. American Judicial Politics. 4 units

Term Typically Offered: W

Prerequisite: POLS 112 or consent of instructor; for Law and Society minors and POLS majors with pre-law concentration.

Empirical aspects of the decision making of federal and state courts, with an emphasis on understanding how interactions between the courts and other political factors shape judicial behavior. 4 lectures.

POLS 341. American Constitutional Law. 4 units

Term Typically Offered: F, W, SP

Prerequisite: POLS 112.

United States Supreme Court decisions in the areas of separation of powers, judicial review, commerce clause, federalism, due process. 4 lectures.

POLS 342. Constitutional Theory. 4 units

Term Typically Offered: W

Prerequisite: POLS 245. Recommended: POLS 112 or POLS 341.

Competing theories of constitutional interpretation. Emphasis on the conflict between judicial review and democracy, effects of political events on constitutional evolution, merits of different approaches to constructing constitutional meaning. 4 lectures.

POLS 343. Civil Rights in America. 4 units

USCP

Term Typically Offered: F, W, SP

Prerequisite: POLS 112.

Case-based examination of discrimination based on race, ethnic, gender, and sexual orientation in the United States. Emphasis on the Supreme Court's interpretation of the Equal Protection Clause. 4 lectures. Fulfills USCP.

POLS 344. Civil Liberties. 4 units

Term Typically Offered: F, W, SP

Prerequisite: POLS 112.

Role of Supreme Court as interpreter of civil liberties. Topics may include freedom of expression and religion, search and seizure, due process of law. 4 lectures.

POLS 347. Politics and Popular Culture. 4 units

Term Typically Offered: TBD

Prerequisite: POLS 112.

Intersection of politics and mass media. How political actors use popular culture to establish issue agendas, convey political concepts, symbolism, rhetoric and values. 4 lectures.

POLS 348. Early American Political Thought. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; one course from D1 (POLS 112 recommended); and one course from either D2 or D3.

The central political ideas of America's leading thinkers from the arrival of the Mayflower to the Civil War. Selections may include readings of American political ideas from Winthrop, Paine, Publius, Hamilton, de Tocqueville, Douglass, Calhoun, Thoreau, and Lincoln, among others. 4 lectures. Fulfills GE D5 except for Political Science majors.

POLS 349. Contemporary American Political Thought. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; completion of one course from D1 (POLS 112 recommended).

The central political ideas of America's leading thinkers from the Civil War to the present. 4 lectures. Fulfills GE D5 except for Political Science majors.

POLS 351. Public Policy and Administration. 4 units

Term Typically Offered: W

Prerequisite: Completion of GE Area D1. Recommended: POLS 112.

Systematic and critical approach to evaluating and designing public policies and the development of management functions in government. Attention given to intergovernmental relations and case studies in economic development, health, the environment, and other policy areas. 4 lectures.

POLS 359. Research Design. 4 units

Term Typically Offered: F, W, SP

Prerequisite: STAT 217.

Methodology and research design used in qualitative and quantitative analysis. Examination of multiple methods used to analyze political phenomena in the political science discipline. 4 lectures.

POLS 361. Quantitative Methodology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: POLS 359.

Survey of quantitative methodology in political science, up to and including multiple regression. Laboratory computer instruction to facilitate understanding of quantitative approaches to political research. 3 seminars, 1 activity.

POLS 375. California Politics. 4 units

Term Typically Offered: W

Prerequisite: Completion of GE D1. Recommended: POLS 112.

Political culture, processes, behavior, institutions, public policy and distribution of power in California state and substate governments. 4 lectures.

POLS 380. Religion and Politics in the Israeli-Palestinian Conflict. 4 units

Term Typically Offered: SP

Prerequisite: Completion of GE Area A with a grade of C- or better.

Recommended: Completion of one class in POLS or RELS.

The root causes of the Israeli-Palestinian conflict and its current manifestation. Possibilities for solutions from the perspectives of religious studies and political science. 4 lectures. Crosslisted as POLS/RELS 380.

POLS 381. Peace and War. 4 units

Term Typically Offered: SP

Prerequisite: POLS 225 or POLS 229.

Dynamics of interstate peace and war. Topics include: military strategy, the military-industrial complex, arms races and disarmament, diplomacy, deterrence and pre-emption, collective security and alliance behavior, civil-military relations, post-conflict reconstruction, and the role of international law and organizations. 4 lectures.

POLS 382. Comparative Foreign Policy. 4 units

Term Typically Offered: SP

Prerequisite: POLS 225 or POLS 229.

Systematic analysis of the international and domestic pressures leading different states to take particular foreign policy stances, with appropriate examples taken from different regions of the world. Discussion of contemporary foreign policy issues and responses. 4 lectures.

POLS 383. Politics of the European Union. 4 units

Term Typically Offered: W

Prerequisite: POLS 225 or POLS 229.

History and development of the European Union in the context of theories of regional integration. Overview of institutional and policymaking machinery of the EU. Current issues facing member states. Impact of EU on US interests and world politics more generally. 4 lectures.

POLS 384. Comparative Law. 4 units

Term Typically Offered: TBD

Prerequisite: POLS 225 or POLS 229.

Survey of cultural, historic, institutional, and social contexts of legal traditions. Emphasis on comparing western common and code law to Confucian, Islamic, indigenous and other nonwestern societies. Comparative topics may include prison reform, property rights, constitutional law, international law, rule of law, and the judicialization of politics. 4 lectures.

POLS 385. Advanced Model United Nations. 2 units

CR/NC

Term Typically Offered: W, SP

Prerequisite: POLS 285.

Preparation for participation in collegiate Model United Nations conferences. Rules of procedure and debate, preparation of country position papers, and resolution writing. Discussion of current issues of concern to the United Nations. Credit/No Credit grading only. Total credit limited to 6 units. 2 lectures.

POLS 386. Government Internship. 2-12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor. Recommended: Junior standing with a minimum 2.5 GPA.

Supervised work experience in a government or related public agency. Intern will function as an employee subject to all the duties and responsibilities of employees engaged in comparable work. 30 hours of work experience per unit of credit. Total credit limited to 12 units. Credit/No Credit grading.

POLS 387. Research Internship. 1-8 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: POLS 359 and POLS 361.

Faculty-supervised research experience on various topics related to politics and government. Student research assistantship with a faculty member engaging in a research project. Total credit limited to 8 units. Credit/No Credit grading only.

POLS 395. Advanced Mock Trial. 2 units

CR/NC

Term Typically Offered: W

Prerequisite: Consent of instructor.

Advanced preparation for participation in intercollegiate mock trial competitions. Emphasis on advanced topics and techniques related to evidence, trial procedure, objections, and witness examination. Extensive hands-on practice in arguing a legal case. Credit/No Credit grading only. Total credit limited to 4 units. 2 lectures.

POLS 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, study, or survey of selected problems. Total credit limited to 4 units.

POLS 417. Feminist Legal Theory. 4 units

Term Typically Offered: SP

Prerequisite: Completion of GE D1. Recommended: POLS 112.

Different approaches to US feminist legal theory and topics in gender and US law. Topics covered include employment, domestic violence, sexual harassment, reproductive justice, sex work, rape, and welfare reform. 4 seminars. Crosslisted as POLS/WGS 417.

POLS 419. Social Movements and Political Protest. 4 units

Term Typically Offered: SP

Prerequisite: Completion of GE D1. Recommended: POLS 112.

Selected U.S. social movements, including abolitionism, feminism, civil rights, gay rights, the Christian right, and environmentalism. Political opportunities and constraints that impact collective political action, and effects of grassroots struggles for justice in U.S. politics and society. 4 lectures.

POLS 420. Contemporary U.S. Foreign Policy. 4 units

Term Typically Offered: SP

Prerequisite: POLS 225 or POLS 229.

Historical influences and theoretical assumptions behind U.S. foreign policy. Examination of American power and influence, examining key concepts from public opinion, business interests, executive privilege, diplomacy, propaganda, trade, and military strategies. 4 lectures.

POLS 425. Comparative Political Corruption. 4 units

Term Typically Offered: TBD

Prerequisite: POLS 112 and POLS 229.

Examination of the causes and effects of corruption in the United States and around the world, and the problems corruption causes in different societies. Particular attention will be placed on the role of political and social institutions. 4 seminars.

POLS 426. International Organizations and Law. 4 units

Term Typically Offered: W

Prerequisite: POLS 225 or POLS 229.

Analysis of contemporary international legal issues, such as arms control and nonproliferation, intellectual property rights and the World Trade Organization, and human rights and the United Nations. Case studies drawn from advancements in the biological sciences, such as those affecting public health. 4 lectures.

POLS 427. Politics of the Global Economy. 4 units

Term Typically Offered: TBD

Prerequisite: POLS 225, completion of GE D2, or consent of instructor.

Political conflicts surrounding the trading, financial, and security structures of the international economy. Motivations, resources, and responses of states, international organizations, multinational corporations and other nonstate actors as they address economic, political, environmental, and security issues within these structures. Desirability and inevitability of globalization. 3 lectures and a research paper.

POLS 428. Issues and Topics in Comparative Politics. 4 units

Term Typically Offered: TBD

Prerequisite: POLS 229.

Selected topics and issues in the field of comparative politics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

POLS 429. Issues and Topics in International Relations. 4 units

Term Typically Offered: W

Prerequisite: POLS 225.

Selected topics and issues in the field of international relations. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

POLS 430. Advanced Topics in Political Theory. 4 units

Term Typically Offered: TBD

Prerequisite: POLS 230.

In-depth examination of a theme or thinker in political theory. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

POLS 431. Issues and Topics in American Politics. 4 units

Term Typically Offered: TBD

Prerequisite: POLS 112 and junior standing.

Selected topics and issues in the field of American politics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

POLS 435. Political Communication. 4 units

Term Typically Offered: SP

Prerequisite: POLS 112 and Junior standing.

Introduction to political communication. Concepts, theories and methods from areas such as communication, media studies, journalism, political science, and public policy. How language and non-verbal communication used by the media, government, and other actors shapes public perception of and behavior in the social, political, and scientific world. 4 lectures.

POLS 440. California Student Bill Project. 2 units

Term Typically Offered: F, W, SP

Prerequisite: POLS 112 and consent of instructor. Recommended: POLS 375.

Experiential, project-based course where students will draft a bill and work to move it through the California Legislature toward becoming law. Field trip may be required. Total credit limited to 6 units. 2 seminars.

POLS 445. Voting Rights and Representation. 4 units

USCP

Term Typically Offered: SP

Prerequisite: POLS 112.

Philosophical, legal, and behavioral analysis of electoral representation; the 1965 Voting Rights Act; vote dilution; racial and partisan discrimination; voter identification and voter suppression. Similarities and differences across and within racial/ethnic/political groups in the US with regards to effective representation. 4 lectures. Fulfills USCP.

POLS 451. Technology and Public Policy. 4 units

Term Typically Offered: W

Prerequisite: Completion of GE D1. Recommended: POLS 112.

Exploration of the historical and contemporary political influences shaping modern science and technology policy. Addresses sources of technological innovation, such as public-private partnerships, military R & D, democratic governance, and competitiveness among industrialized nations. Case studies may include cybersecurity, geoengineering, nanotechnology, and neurosciences. 4 seminars.

POLS 452. Technology and International Development. 4 units

Term Typically Offered: F

Prerequisite: Completion of GE Area D3.

Examines potential for advanced technologies to support international development from political and social science perspective. Reviews historical efforts toward and socio-economic contexts of global development. Analyzes current applications of advanced technology for sustainable development, democracy-building, education, healthcare, and policy reform. 4 seminars.

POLS 457. U.S. Reproductive Politics. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE D1. Recommended: POLS 112.

Multi-disciplinary approach to the study of the law and politics of reproduction in the United States. Topics studied include histories of reproductive regulation, abortion law and politics, technology and fertility, and social policy and reproductive control. 4 seminars. Crosslisted as POLS/WGS 457.

POLS 459. The Politics of Poverty. 4 units

Term Typically Offered: F

Prerequisite: Completion of GE D1. Recommended: POLS 112.

Analysis of the politics and policies associated with the American welfare state, focusing on welfare and homelessness policies. Exploration of the causes of poverty and how social policy responds to poverty. 4 lectures.

POLS 461. Senior Project I. 2 units

Term Typically Offered: F, W, SP

Prerequisite: POLS 359, POLS 361, and senior standing.

Selection and completion of a project under faculty supervision. Project results presented in a formal paper.

POLS 462. Senior Project II. 2 units

Term Typically Offered: F, W, SP

Prerequisite: POLS 359, POLS 361, and senior standing.

Selection and completion of a project under faculty supervision. Project results presented in a formal paper.

POLS 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: POLS 112 and junior standing.

Directed courses on timely issues and topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1-4 lectures.

POLS 471. Urban Politics. 4 units

Term Typically Offered: W

Prerequisite: POLS 112.

Theoretical approaches, concepts, and politics associated with urban governments. Urban power structures, the relationship between urban society and politics, and inter-governmental relations. 3 lectures and a research paper.

POLS 500. Independent Study. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing with minimum of 12 units.

Individual research, studies, or surveys under the supervision of the faculty. Total credit limited to 4 units.

POLS 510. Research Design. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Approaches to policy research, question development, hypothesis framing, literature reviews, sampling, measurement, and approaches to analysis. 4 lectures.

POLS 515. Public Policy. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing, or consent of instructor.

Theoretical and practical approaches to public policy making and contemporary policy issues such as markets; regulation; criminal justice; housing; environment; poverty; health care and education. 4 lectures.

POLS 518. Public Policy Analysis. 5 units

Term Typically Offered: W

Prerequisite: Graduate standing or consent of instructor.

Contextual, problem oriented analysis of the societal problems and possible solutions to them. Development and use of concepts and tools related to policy evaluation with particular emphasis on qualitative methods. 4 lectures, 1 activity.

POLS 540. Leadership and Management in Public Policy. 4 units

Term Typically Offered: SP

Prerequisite: POLS 515 and graduate standing or consent of instructor.

An exploration of the changing notion of leadership in public policy. Focus on understanding and developing leadership capacity within the complex inter-organizational structure in which the student works. 4 seminars.

POLS 550. Regulatory and Economic Policy. 4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Theories of regulatory and economic policy, including markets and market failures, politics of economic policy, and applications of government regulatory and economic policy, and skills and experience necessary to social and economic questions. 4 seminars.

POLS 560. Quantitative Methods. 5 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor.

Social science methodology focusing on research design and quantitative methods used in policy and political research, such as multi-regression, non-linear techniques, diagnostics and time series. Advanced computer packages used to analyze challenging data sets. 4 lectures, 1 activity.

POLS 568. Topics and Issues in Public Policy. 4 units

Term Typically Offered: TBD

Prerequisite: POLS 515 or consent of instructor.

Selected advanced topics applicable to public policy problems. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 3 seminars and a research project.

POLS 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

POLS 586. Policy Internship. 4-8 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Completion of 12 units in the Master of Public Policy Program, and consent of instructor.

Supervised work experience in a government or related public agency. Intern will function as an employee engaged in comparable work. Credit/No Credit grading only. Total credit limited to 8 units.

POLS 590. Graduate Seminar. 4 units

Term Typically Offered: F, W

Prerequisite: POLS 560 or consent of instructor.

Seminar designed as a culminating component to the Master of Public Policy Program. Individual research under the supervision of the faculty within a small discussion environment, leading to a graduate project or paper that demonstrates practical mastery of the MPP curriculum. Total credit limited to 8 units. 4 seminars.

POLS 595. Directed Readings for MPP Comprehensive Exams. 2 units

CR/NC

Term Typically Offered: SP

Prerequisite: POLS 590.

Directed readings and preparation for Master of Public Policy (MPP) comprehensive exams. Regular consultation between advisor and student. Credit/No Credit grading only. 2 seminars.

Psychology (PSY)

PSY Courses

PSY 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: PSY 201 or PSY 202 and consent of department head.

Individual investigation, research, study or survey of selected problems in consultation and with prior approval of instructor. Written report required. Total credit limited to 4 units.

PSY 201. General Psychology. 4 units

GE Area D4

Term Typically Offered: F, W, SP

Introduction to the psychological study of human beings. Applications and research in area such as psychobiology, perception, learning, motivation, consciousness, memory and cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology and psychotherapy. A student may enroll for credit in either PSY 201 or PSY 202, but not both. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE D4.

PSY 202. General Psychology. 4 units

GE Area D4

Term Typically Offered: F, W, SP

Introduction to the psychological study of human beings. Applications and research in area such as psychobiology, perception, learning, motivation, consciousness, memory and cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology and psychotherapy. A student may enroll for credit in either PSY 201 or PSY 202, but not both. 3 lectures, 1 discussion. Fulfills GE D4.

PSY 212. Interpersonal Communication. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A2 with a grade of C- or better.

Introduction to the interaction process in two-person (dyadic) communication settings. Emphasis on the functions of varying messages in the initiation, development, maintenance and termination of personal and professional relationships. 4 lectures. Crosslisted as COMS/PSY 212.

PSY 251. Laboratory in Group Activities. 1-3 units

CR/NC

Term Typically Offered: TBD

Skills and techniques of solving problems in large and small groups. Conducting and reporting meetings. Analyses of leadership dynamics in campus organizations. Credit/No Credit grading only. Total credit limited to 6 units. 1-3 activities.

PSY 252. Social Psychology. 4 units

Term Typically Offered: F, W

Prerequisite: PSY 201 or PSY 202.

How attitudes, beliefs, and behavior are affected by the social situation. Gender roles, prejudice, aggression, altruism, attitudes and persuasion, liking and loving, and group behavior. Use of social psychology to understand diversity issues, reduce racism and sexism and international conflict, improve relationships, and communicate persuasively. 4 lectures.

PSY 254. Family Psychology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202.

Introduction to research and theory on family relationships and behavior across the lifespan. Contextual influences, diversity of family forms, and topics such as love, mate selection, marital quality, parenting, gender, household work, divorce, and remarriage. 4 lectures. Crosslisted as CD/PSY 254.

PSY 256. Developmental Psychology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202.

Introduction to the scientific study of development with emphasis on the lifespan, from infancy to old age. Basic research and concepts in understanding social, emotional, cognitive, contextual, and diversity influences on development. 4 lectures. Crosslisted as CD/PSY 256.

PSY 260. African American Psychology. 4 units

USCP

Term Typically Offered: TBD

Recommended: PSY 201 or PSY 202.

A historical overview of African American psychology, and a critical examination of the psychocultural forces (e.g., history of slavery, racism, oppression, education, familial factors) that have helped to shape the beliefs, attitudes, identities, behavior, and well-being of African Americans.

PSY 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

PSY 301. Psychology of Personal Development. 4 units

Term Typically Offered: TBD

Prerequisite: PSY 201 or PSY 202.

Application of developmental psychology to self awareness. Includes communication skills, self modification skills and examination of life goals and values. 4 lectures.

PSY 302. Behavior in Organizations. 4 units

Term Typically Offered: F, W

Prerequisite: PSY 201 or PSY 202.

Characteristics of functioning organizations and their effects on individuals. Psychological issues relevant to the maintenance of the organization. Motivation, leadership, group phenomena, communication, decision-making, attitudes, personnel selection and organizational change. 4 lectures.

PSY 304. Intergroup Dialogues. 4 units

GE Area D5

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area D1, D3, or D4. Recommended: Completion of USCP.

Weekly meetings of students from two distinct self-defined identity groups, with trained peer facilitators, in which readings, experiential activities, informed dialogue, and reflective writing are integrated as a means of encouraging self and group awareness and exploring ways to promote just community across difference. Supplemented by weekly lecture/discussions. 2 lectures, 2 discussions. Crosslisted as CRP/PSY 304. Fulfills GE D5 except for the following majors: City and Regional Planning, Child Development, and Psychology.

PSY 305. Personality. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202.

Personality theories and research. Assessment, dynamics, and development of personality. Trait, behavioral, social learning, cognitive, humanistic, psychoanalytic and biological approaches. 4 lectures.

PSY 306. Adolescence. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 256 or CD/EDUC 207.

Psychological analysis of the years from prepubescence to young adulthood. Current research on behavior and development during adolescence with emphasis on physical, affective, cognitive, sociocultural, historical, family, peer and school aspects of life during the post-child, pre-adult years. 4 lectures. Crosslisted as CD/PSY 306.

PSY 310. Psychology of Death. 4 units

Term Typically Offered: TBD

Prerequisite: PSY 201 or PSY 202.

Psychological aspects of death, loss and grief, including scientific findings, person-culture transactions and expressions in the arts and humanities. Personal exploration and interdisciplinary application of psychology to issues such as death anxiety, dying processes, funerals, immortality beliefs, suicide, and grieving. 4 lectures.

PSY 311. Environmental Psychology. 4 units

GE Area D5

Term Typically Offered: F, W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area D4 (PSY 201 or PSY 202 recommended).

Interrelationship between behavior and the built and natural environments. Evaluating and understanding environments, environmental stress, and the human aspects of environmental problems. 4 lectures. Fulfills GE D5 except for Psychology and Child Development majors.

PSY 317. Psychology of Stress. 4 units

Term Typically Offered: TBD

Prerequisite: PSY 201 or PSY 202.

Examines the relationship between stress and psychological and physical well-being. Research on the psychological factors influencing stress as well as a description and critical evaluation of methods of stress reduction. 4 lectures.

PSY 318. Psychology of Aging. 4 units

GE Area D5

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or PSY major; completion of GE Area A with a grade of C- or better; one lower-division GE Area D course (PSY 201 or PSY 202 recommended).

Psychological and physiological aging in the context of the culture. Theories and research relating to the issues of stability and both positive and negative changes in perception, learning, memory, intelligence, personality, identity, motivation, sexuality, family relationships, career. Disorders, institutionalization, death and bereavement. 4 lectures. Fulfills GE D5 except for Psychology and Child Development majors.

PSY 320. Health Psychology. 4 units

Term Typically Offered: W

Prerequisite: PSY 201 or PSY 202.

Scientific study of how mental, behavioral, and social processes affect physical health. Topics include health-risk behaviors and promotion of personal control over health improvement, social status and health disparities, stress and coping, and the patient-provider relationship. 4 lectures.

PSY 323. The Helping Relationship. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing, completion of one USCP course, Psychology and Child Development majors only, or consent of instructor.

Basic skills and approaches common to helping relationships with children, adults, and families. Examines theoretical, empirical, and practical applications of helping. Differentiation between professional, paraprofessional, and nonprofessional helping relationships. 2 lectures, 2 activities.

PSY 324. Psychology of Gender. 4 units

Term Typically Offered: SU

Prerequisite: PSY 201 or PSY 202.

Investigation of psychological genders and sexualities beyond ideas associated with biological sex. Exploration of sex/gender/sexuality differences from a social psychological (e.g., socialization) perspective. Implications of gender roles (including masculinity, femininity, non-binary) and sexual identities for relationships and health. 4 lectures. Crosslisted as PSY/WGS 324.

PSY 325. Introduction to Positive Psychology. 4 units

Term Typically Offered: W

Prerequisite: PSY 201 or PSY 202.

Scientific study of the enhancement of strengths and optimal functioning in humans. Basic research, assessment and helping concepts in understanding optimal functioning within diverse populations. 4 lectures.

PSY 329. Research Methods in Psychology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202, STAT 217 or STAT 211, or consent of instructor.

Introduction to research methods used in psychology and other behavioral sciences. Topics include the logic and ethics of research; experimental, correlational, and survey methodology; library search strategies; basic statistical procedures; and the format of the research report. 3 lectures, 1 activity.

PSY 330. Behavioral Effects of Psychoactive Drugs. 4 units

Term Typically Offered: F, W

Prerequisite: Completion of GE D4.

Pharmacokinetic, pharmacodynamic and behavioral effects of psychoactive drugs. Social and psychological issues related to drug use and misuse. 4 lectures.

PSY 333. Quantitative Research Methods for the Behavioral Sciences. 3 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 329 or SOC 333, and STAT 217, or consent of instructor.

Thorough introduction to the quantitative aspects of empirical research. Using SPSS statistical software, students will learn how to choose, conduct, and interpret analyses of research data from different behavioral science disciplines. 2 lectures, 1 activity.

PSY 340. Biopsychology. 4 units

GE Area B5

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202.

Relationship between physiological and behavioral processes such as learning and memory, language, sleep, and abnormal behavior. Information processing, biochemistry, and structural organization at the cellular and nervous system levels. 4 lectures. Fulfills GE B5.

PSY 344. Behavioral Genetics. 4 units

GE Area B5

Term Typically Offered: F, W

Prerequisite: PSY 201 or PSY 202; and one of the following: ASCI 112, BIO 111, BIO 123, BIO 161, or BIO 213. Recommended: STAT 217 or STAT 218.

Examine the relative influence of genetic and environmental factors on human behavior. Emphasis on the foundation and application of behavioral genetics to the field of psychology. Topics include heritability, gene-environment interplay, ethics, and emerging technologies. 4 lectures. Fulfills GE B5.

PSY 350. Teamwork. 4 units

Term Typically Offered: F, W

Prerequisite: Completion of GE D4.

Group dynamics applied to teams. Topics include team development, basic team processes, conflict management, decision making, leadership, problem solving, and the impacts of diversity and culture on teams. Focus on effective use of teams in the workplace. Not open to students with credit for PSY 351. 4 lectures.

PSY 351. Group Dynamics. 4 units

Term Typically Offered: TBD

Prerequisite: PSY 252 or PSY 323.

Dynamics of small groups. Topics include functions of groups, group structure, power, leadership, intragroup conflict, personal space and territoriality, groups as agents of societal and personal change. Demonstrations emphasizing experiential learning in groups. Not open to students with credit for PSY 350. 2 lectures, 2 activities.

PSY 352. Conflict Resolution: Violent and Nonviolent. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing or PSY major; completion of GE Area A with a grade of C- or better; and one lower-division GE area D course (PSY 201 or PSY 202 recommended).

Psychological, situational, political, and cultural determinants of violence and nonviolence in interpersonal, intergroup, and international conflict. Self-assessment of conflict resolution attitudes, competencies, and behaviors. Negotiation, mediation, and other approaches to conflict management. Educational and structural approaches to violence prevention. 4 lectures. Fulfills GE D5 except for Psychology and Child Development majors.

PSY 360. Applied Social Psychology. 4 units

Term Typically Offered: TBD

Prerequisite: PSY 252.

Applications of social psychology to education, business and industry, environmental problems, interpersonal and intergroup relations, health and welfare, mass communication, judicial systems, and politics. Analysis of social and organizational problems, methods of intervention, and program evaluation. 4 seminars.

PSY 370. Introduction to Clinical and Counseling Psychology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202 and at least one other PSY course.

Introduction to the fields of clinical and counseling psychology. History, education and training, theories, assessment, diagnosis, and treatment. Introduction to diverse settings, ethical principles, legal guidelines, credentialing and employment opportunities. 4 lectures.

PSY 372. Multicultural Psychology. 4 units

USCP

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202; and sophomore standing.

The impact of culture, ethnicity, and race on human behavior within the framework of psychological theory and research. Emphasis on ethnic minority groups within the U.S. including: African Americans, Native Americans, Asian Americans/Pacific Islanders, and Latino/a Americans. Not open to students in MS Psychology program. 4 seminars.

PSY 375. Forensic Psychology. 4 units

Term Typically Offered: W

Prerequisite: PSY 201 or PSY 202.

Application and practice of psychology in both the civil and criminal justice systems. Examination of police and investigative psychology, correctional psychology, expert witness testimony, psychological evaluations for the courts, understanding aggression. 4 lectures.

PSY 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: PSY 201 or PSY 202.

Individual investigation, research, study or survey of selected problems in consultation and with prior approval of instructor. Written report required. Total credit limited to 4 units.

PSY 401. Special Problems: Experiential Learning. 2-4 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Psychology major or gerontology minor, junior standing, and consent of instructor.

Supervised experience in various community, governmental, educational, or research settings. Especially designed for individuals in applied settings requiring additional hours or a pre-fieldwork training experience. Applied psychological, developmental, or educational experiences determined by participating institution, supervising faculty member, and student. Cannot be substituted for PSY 448, PSY 449, PSY 453, or PSY 454. Credit/No Credit grading only. Total credit limited to 4 units.

PSY 405. Abnormal Psychology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202.

Normal and abnormal behavior in everyday life. Anxiety, somatoform, dissociative, mood, childhood, personality, psychotic, cognitive, eating, and substance use disorders and their treatment. 4 lectures.

PSY 410. History and Systems of Psychology. 4 units

Term Typically Offered: W

Prerequisite: PSY 333.

Survey of the philosophical and scientific roots of modern psychology, pioneer laboratories, systems, and schools of psychology, the refining of experimental methods, and applications of psychology in testing and psychological services. Examination of contributions by women and minorities in psychology. 4 seminars.

PSY 417. Interpersonal Relationships in Childhood and Adolescence. 4 units

Term Typically Offered: F, W, SP

Prerequisite: CD 304, CD 305 or CD 306; or PSY 256 and PSY 305.

Current theories and research on the development of interpersonal relationships in childhood and adolescence. Topics may include parent-child relationships, peer relationships in childhood, intimate relationships in adolescence. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Crosslisted as CD/PSY 417.

PSY 419. Self and Identity. 4 units

Term Typically Offered: TBD

Prerequisite: PSY 256 or PSY 305 and senior standing.

Concepts, theories, and research related to the development of the self across the lifespan. Examination of the influence of temperament, culture, individuation, self-esteem, self-awareness, roles and identity on maturity. 4 seminars.

PSY 430. Sensation and Perception. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 340.

Principles of sensory systems, psychophysics, attention and the perception of color, shape, movement, space, and time. Survey of the development of perception through the lifespan. 4 lectures.

PSY 431. Assessing Children's Development and Environments. 4 units

Term Typically Offered: TBD

Prerequisite: CD 304 or CD 305 or PSY 419 or PSY 420 or PSY 421; and CD 329 or PSY 329.

Current developmental and environmental assessments used in care and educational settings and in prevention programs and research. Practice using, creating, and evaluating child assessments. 3 lectures, 1 activity. Crosslisted as CD/PSY 431.

PSY 432. Psychological Testing. 4 units

Term Typically Offered: SP

Prerequisite: PSY 333.

Theory and practice of psychological measurement and testing. Principles of test construction, administration, and interpretation. Survey of common testing domains such as intelligence, scholastic aptitude and achievement, and personality. 4 lectures.

PSY 448. Research Internship I. 5 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: PSY 329, PSY 333, Psychology and Child Development majors only, junior standing, and consent of instructor.

Faculty-supervised research experience on various topics in psychology. Student apprenticeship with a department faculty member to conduct research. Responsibilities include some or all of the following: collecting data, entering and/or analyzing data, electronic literature search, report writing. Credit/No Credit grading only.

PSY 449. Research Internship II. 5 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: PSY 329, PSY 333, Psychology and Child Development majors only, junior standing, and consent of instructor.

Faculty-supervised research experience on various topics in psychology. Student apprenticeship with a department faculty member to conduct research. Responsibilities include some or all of the following: collecting data, entering and/or analyzing data, electronic literature search, report writing. Credit/No Credit grading only.

PSY 450. Family Intervention. 4 units

Term Typically Offered: TBD

Prerequisite: PSY 254, or graduate standing.

Basic elements of marriage and family therapy and crisis intervention. Emphasis on concepts, goals, and techniques of various family therapy approaches and family crisis intervention. 4 lectures.

PSY 453. Supervised Fieldwork I. 5 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: PSY 323, Psychology and Child Development majors only, junior standing, and consent of instructor.

Supervised fieldwork experience in various community, governmental, and educational settings. Applied psychological, developmental, or educational experiences determined by participating institution, supervising faculty member, and student. Credit/No Credit grading only.

PSY 454. Supervised Field Work II. 5 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: PSY 323, Psychology and Child Development majors only, junior standing, and consent of instructor.

Supervised fieldwork experience in various community, governmental, and educational settings. Applied psychological, developmental, or educational experiences determined by participating institution, supervising faculty member, and student. Credit/No Credit grading only.

PSY 456. Behavioral Disorders in Childhood. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202, junior standing.

Applications of psychological principles to childhood behavioral disorders. Aggression, delinquency, stress reactions, motivational, perceptual-attentional deficiencies, psychoses, anxiety disorders, biological dysfunctions, and social, emotional and intellectual disabilities. 4 seminars. Crosslisted as CD/PSY 456.

PSY 457. Memory and Cognition. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 333.

Principles and theories of memory and cognition including processes; models of perception, attention and memory; concept formation; language; intelligence; problem-solving and decision making; creativity; applications to areas such as law, artificial intelligence, and education. 4 lectures.

PSY 458. Learning. 4 units

Term Typically Offered: F, W

Prerequisite: PSY 333.

Theoretical and philosophical foundations of the experimental analysis of behavior. Principles of classical and operant conditioning including aversive control of behavior through punishment and avoidance learning and the theoretical basis for behavior therapy techniques and applications of learning principles in education and health settings. 4 lectures.

PSY 459. Lifespan Theories. 4 units

Term Typically Offered: TBD

Prerequisite: PSY 201 or PSY 202, junior standing.

Comparative study of theories that have been offered as explanations for lifespan development. Controversial issues, evaluations and applications of theories. Emphasis on biological, psychological, and social aspects of lifespan development. 4 seminars.

PSY 460. Child Abuse and Neglect. 4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 201 or PSY 202 and junior standing.

Issues in child maltreatment, including definitions and forms, causes, consequences, assessment, reporting, treatment, and prevention. Possible links among research, intervention, and public policy will be emphasized. 4 seminars. Crosslisted as CD/PSY 460.

PSY 461. Senior Project Seminar. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Senior standing; PSY 329; Psychology and Child Development majors only.

Discussion of occupational and graduate school opportunities and of current issues in psychology for the purpose of defining professional objectives and individual projects for PSY 462. Senior project progress reports with class critique. Credit/No Credit grading only. 1 seminar.

PSY 462. Senior Project. 3 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 461; Psychology and Child Development majors only.

Design and completion of a faculty-supervised project in psychology. The project must be presented in a formal, written report. Minimum of 90 hours total time.

PSY 465. Cross-Cultural International Psychology. 4 units

Term Typically Offered: W, SP

Prerequisite: PSY 201 or PSY 202 and junior standing.

Psychological, cultural, ecological and behavioral influences on human development in different cultural settings. Focuses on from one to three different cultures outside the U.S. in any given quarter. 4 seminars.

PSY 470. Selected Advanced Topics. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing and consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 seminars.

PSY 475. The Social Psychology of Prejudice. 4 units

USCP

Term Typically Offered: SP

Prerequisite: PSY 252 or PSY 254 or PSY 256.

Examination of social psychological frameworks for understanding the origins and consequences of prejudice and ways to improve relationships between people who come from different social groups (e.g., race, ethnicity, class, age, sexual orientation, gender). 4 lectures. Fulfills USCP.

PSY 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 12 units. Credit/No Credit grading only.

PSY 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 12 units. Credit/No Credit grading only.

PSY 500. Individual Study. 1-6 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head, graduate major advisor and supervising faculty member.

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements.

PSY 504. Psychopharmacology. 4 units

Term Typically Offered: SP

Prerequisite: Graduate standing or consent of instructor.

Advanced course in brain-behavior relationships. Neuropathology of brain disorders including the neurochemical etiology and treatment of mental illness and chemical dependency. 4 seminars.

PSY 520. Marriage & Family Therapy: Professional Identity, Theory and Practice. 4 units

Term Typically Offered: F

Prerequisite: enrollment in the M.S. in Psychology program.

History, development, and systemic foundations of the field of Marriage and Family Therapy. Major models and theories of family therapy with focus on the sociocultural contexts of defining healthy and dysfunctional dynamics, treatment goals, and associated approaches. Current issues relating to professional identity and functioning in the field. 4 seminars.

PSY 535. Child and Adolescent Psychopathology. 4 units

Term Typically Offered: F

Prerequisite: enrollment in the M.S. in Psychology program.

Etiological, assessment, diagnostic, and treatment models of child and adolescent disorders. Diagnostic and Statistical Manual of Mental Disorders. Genetic, neurobiological, environmental, and sociocultural factors of childhood disorders within a developmental perspective. Current theory, research, and practice emphasized. 4 seminars.

PSY 555. Counseling & Communication. 4 units

Term Typically Offered: W

Prerequisite: PSY 560 and admission to MS Psychology program.

Overview of the counseling profession, history, philosophy, theory, and ethics. Emphasis on developing interviewing, assessment and communication skills. 3 seminars, 1 activity.

PSY 556. Multicultural Counseling and Psychology. 4 units

Term Typically Offered: SP

Prerequisite: PSY 555, PSY 560 and admission to MS Psychology program.

Psychological, cultural, and ecological analysis of the experiences and histories of various cultural groups within the United States. Development of personal self-awareness of multicultural issues and culturally relevant counseling skills. 4 seminars.

PSY 560. Individual Therapy: Theory and Application. 4 units

Term Typically Offered: F

Prerequisite: Admission to MS Psychology program.

Counseling theories and concepts applied to individuals. Develop skills in interviewing, assessment, intervention selection, termination and crisis intervention. Ethics and law included. 4 seminars.

PSY 564. Ethics and the Law: MF Therapy. 4 units

Term Typically Offered: SU

Prerequisite: PSY 520; PSY 560; and admission to MS Psychology program.

Ethical, legal and case management issues related to individual, child, family and group therapy. Client rights and professional orientation to ethical standards and state regulation of clinical practice. 4 seminars.

PSY 565. Diagnosis and Treatment: Psychopathology. 4 units

Term Typically Offered: W

Prerequisite: PSY 560 and admission to MS Psychology program.

Assessment of mental status. Diagnostic and statistical Manual of Mental Disorders, treatment planning, treatment case documentation and research applied to client psychopathology. 4 seminars.

PSY 566. Group Therapy: Theory and Application. 4 units

Term Typically Offered: SP

Prerequisite: PSY 560 and admission to MS Psychology program.

Group therapy theory, leadership and research applied to client assessment, screening, treatment selection, evaluation and termination. Ethics, law included. 4 seminars.

PSY 568. Advanced Psychotherapies. 4 units

Term Typically Offered: F

Prerequisite: PSY 555, PSY 560, PSY 565 and admission to MS Psychology program, or consent of instructor.

Theory and application of advanced approaches in psychotherapy, including, but not limited to: cognitive-behavioral therapies, psychodynamic therapies and humanistic/existential therapies. The Schedule of Classes will list therapy selected. Total credit limited to 12 units. 4 seminars.

PSY 569. Counseling Clinic Practicum. 3 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: PSY 520; PSY 555; PSY 560; PSY 565; and admission to MS Psychology program.

Applied experience and instruction in assessment, diagnosis, treatment planning and treatment of individuals, couples, families and children under direct supervision of faculty in program clinic. Total credit limited to 12 units. Credit/No Credit grading only.

PSY 570. Selected Advanced Topics. 4 units

Term Typically Offered: TBD

Prerequisite: Admission to MS Psychology program or consent of instructor.

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors. Class Schedule will list topic selected. Total credit limited to 8 units. 4 seminars.

PSY 571. Advanced Family Therapy: Theory and Application. 4 units

Term Typically Offered: F

Prerequisite: PSY 520; PSY 555; and admission to MS Psychology program.

Theory and application of process, structural and systems approaches to family therapy. Assessment, diagnosis, treatment and follow-up of family therapy. Ethics and law related to family therapy. 4 seminars.

PSY 572. Child and Adolescent Therapy: Theory and Application. 4 units

Term Typically Offered: W

Prerequisite: PSY 535; PSY 555; PSY 560; and admission to MS Psychology program.

Assessment, diagnosis, treatment planning and therapeutic modalities appropriate for children and adolescents. Both theoretically based and empirically based treatment approaches presented. Instruction in the assessment and treatment of abuse and neglect of children with relevant ethics and law. 4 seminars.

PSY 574. Psychological Assessment. 4 units

Term Typically Offered: W

Prerequisite: Admission to MS Psychology program.

Administration, scoring and interpretation of psychological tests. Reliability and validity of psychological measures. Ethical and cultural issues in testing. 4 seminars.

PSY 575. Gender and Couple Therapy. 4 units

Term Typically Offered: SP

Prerequisite: PSY 520; PSY 560; and admission to MS Psychology program.

Antecedents to sex-role identity, gender aware therapy, couple therapy, treatment of spousal/partner abuse; human sexuality, behavior, and psychosexual dysfunction. 4 seminars.

PSY 576. Traineeship: Marital and Family Therapy. 4 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: PSY 569, PSY 564 and consent of MS program committee.

Supervised experience in applied psychotherapeutic techniques, assessment, diagnosis and treatment of individual, marital, family and child relationship problems. Total credit limited to 16 units. Credit/No Credit grading only. Weekly seminar with on-site and university supervisors.

PSY 577. Community Mental Health: Issues and Practices. 4 units

Term Typically Offered: SP

Prerequisite: Admission to the MS Program in Psychology; PSY 535; PSY 555; PSY 556; and PSY 560.

An overview of community mental health as envisioned via California's Mental Health Services Act. Examination of the opportunities and challenges in delivering effective mental health services in publicly-funded settings. Exploration of concepts and practices, including the recovery model and innovative approaches. 4 seminars.

PSY 585. Research Methods for Counseling Psychology. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing or consent of instructor.

Research methods relevant to practitioners in counseling psychology and human services. Basic understanding of descriptive and inferential statistics as well as applications related to these topics. 4 seminars.

PSY 588. Assessment and Treatment of Substance Use Disorders. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing; PSY 560; PSY 565; and PSY 574.

Etiological and biopsychosocial factors, as well as assessment, diagnosis, and evidence-based treatment of substance use disorders. Differential diagnosis, co-occurrence with other conditions, unique population concerns, including use across the lifespan, and local treatment options will be discussed. 4 seminars.

PSY 599. Thesis. 2-4 units

Term Typically Offered: F, W, SP

Prerequisite: PSY 585 and advancement to candidacy.

Completion of a thesis pertinent to the fields of psychology and human services. Total credit limited to 8 units.

Religious Studies (RELS)

RELS Courses

RELS 201. Religion, Dialogue, and Society. 4 units

GE Area D3

Term Typically Offered: F

The way in which interactions between religious traditions shape society at various levels. Case studies drawn from eastern and western religious traditions during the ancient and modern periods. 4 lectures. Fulfills GE D3.

RELS 205. Jesus. 4 units

Term Typically Offered: TBD

Exploration and analysis of the person of Jesus. Includes examination of our sources of knowledge about him, his self-understanding, and various interpretations of him in historical, comparative, and contemporary settings. 4 lectures.

RELS 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

RELS 301. Religions of Asia. 4 units

GE Area C4

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C2.

Comparative study of the religions of Asia, particularly Hinduism, Buddhism, and the religions of China. Topics include historical continuities/discontinuities, worldviews, sacred texts, practices, responses to modernity, the place of women across the traditions. 4 lectures. Fulfills GE C4.

RELS 302. Abrahamic Religions: Judaism, Christianity, and Islam. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C2.

An introduction to the global religions of Judaism, Christianity, and Islam, with a focus on their shared origin in the Patriarch Abraham. Topics include for each religion: the origins, worldview, scripture, practices, and relationship to modernity. 4 lectures. Fulfills GE C4.

RELS 304. Judaism. 4 units

GE Area C4

Term Typically Offered: F

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C2.

Origins, beliefs and practices of Judaism and central themes in the Hebrew Bible. The development of Judaism in the post-biblical and Talmudic period. Jewish philosophy, life, rituals and customs. The emergence of modern Judaism, Zionism and post-Holocaust philosophy. 4 lectures. Fulfills GE C4.

RELS 306. Hinduism. 4 units

GE Area C4

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C2.

Origins, beliefs and practices of Hinduism from the Veda and the Upanishads through the teachings of the Bhagavad Gita and the Puranas. Modern Hindu institutions, saints and sages, and social philosophy contrasted with the ancient. 4 lectures. Fulfills GE C4.

RELS 307. Buddhism. 4 units

GE Area C4

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C2.

Buddhist origins, viewpoints and practices will be seen in their development in India, Tibet, China, Japan, South Asia and America. The life of Buddha, Gautama, the rise of Theravada, Mahayana and Tantra. Encounters with Shinto and Confucianism. 4 lectures. Fulfills GE C4.

RELS 310. Christianity. 4 units

GE Area C4

Term Typically Offered: F

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C2.

The development of the Christian religion from the story of Jesus, the New Testament, Church formation, the role of St. Paul, dissenting ideas, Protestant and Catholic views, and contemporary issues of conscience, such as the Social Gospel and liberation theologies. 4 lectures. Fulfills GE C4.

RELS 311. Islam. 4 units

GE Area C4

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C2.

The development of Islamic civilization from the inspiration of the Qur'an and the Prophet Muhammad and the Sunni-Shi'i split to contemporary political and social issues. Emphasis of Sufi literature, art, architecture, and philosophies of Islam. 4 lectures. Fulfills GE C4.

RELS 344. Approaches to Religion and Spirituality. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area D3 or D4.

Examination of religion from an academic perspective by surveying the various historical approaches employed within the discipline of religious studies to collect, analyze, and interpret religious phenomena cross-culturally. 4 lectures. Fulfills GE D5.

RELS 370. Religion, Gender, and Society. 4 units

GE Area C4; USCP

Term Typically Offered: W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C2.

Critical examination of religious ideas and institutions in the United States. Focus on interlocking systems of sex, gender, race, class and religion; individual and group experiences at the intersection of religion, politics and culture. 4 lectures. Crosslisted as RELS/WGS 370. Fulfills GE C4 and USCP.

RELS 372. Spiritual Extremism: Asceticism, Mysticism, and Madness. 4 units

GE Area C4

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C2.

Shaping influence of ascetics, mystics and the insane on global religious traditions. Topics may include the relationship between spiritual extremists and society, cultural construction of holiness and insanity, and literary depictions of spiritual extremists. 4 lectures. Fulfills GE C4.

RELS 374. Religion and Violence. 4 units

GE Area C4

Term Typically Offered: F, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C2.

Historical and contemporary case studies of how various religions have condoned, motivated and justified violence. The place of sacrifice, martyrdom, self-injury and forced conversion in religious doctrines. Representations of religious violence in the media. 4 lectures. Fulfills GE C4.

RELS 376. Religion, Science and Technology. 4 units

GE Area F

Term Typically Offered: F, W

Prerequisite: completion of GE area B and Junior standing.

Interdisciplinary investigation of relationships between religion, science and technology, including the ethical implications of various technologies. Topics may include human origins, medical technology, environment, reproduction, social media and emerging technologies. 4 lectures. Fulfills GE area F.

RELS 378. Religion and Contemporary Values. 4 units

GE Area C4

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C2.

Descriptive analysis of how diverse religious traditions construct moral decisions about a variety of contemporary issues including sexuality, ecology, and justice. Challenges for religious value systems in secular and pluralistic societies. 4 lectures. Fulfills GE C4.

RELS 380. Religion and Politics in the Israeli-Palestinian Conflict. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A with a grade of C- or better.

Recommended: Completion of one class in POLS or RELS.

The root causes of the Israeli-Palestinian conflict and its current manifestation. Possibilities for solutions from the perspectives of religious studies and political science. 4 lectures. Crosslisted as POLS/RELS 380.

RELS 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair and instructor.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units.

RELS 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. The Schedule of Classes will list topics selected. Total credit limited to 8 units. 1-4 lectures.

SCM Courses**SCM 101. Introduction to Health Profession Careers. 1 unit**

CR/NC

Term Typically Offered: SP

Introduction to health profession careers. Professionals from within the health care industry provide an overview of their careers. Emphasis on creating a pre-health career plan, academic course selection, obtaining appropriate experiences, and elements of a strong professional application. Intended for students undecided about their health professions career choice. Credit/No Credit grading only. 1 activity.

SCM 150. Supplemental Workshops in Science. 1 unit

CR/NC

Term Typically Offered: F,W,SP,SU

Concurrent: Enrollment in the designated section of the associated course.

Facilitated study and discussion of the theory, concepts, and applications of content material from selected biology, chemistry, physics, and statistics courses. Credit/No Credit grading only. Total credit limited to 8 units. Maximum of 2 units for degree credit. 1 laboratory.

SCM 220. Seminar for Science and Math Tutors. 1 unit

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: MATH 142, PHYS 132, PHYS 133, PHYS 122, PHYS 123, PSC 102, or PSC 103; and consent of instructor.

Concepts of teaching and learning as it relates to roles as K-12 grade science and math tutors and/or classroom assistants. Restricted to students who are Teaching Assistants in Math and Science (TeAMS) tutors or Volunteers in Out of School Time (VOST). Participation in public schools requires mandated fingerprint clearance. 1 activity.

SCM 230. Seminar for Learning Assistants. 2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: BIO 160, BIO 161, CHEM 124, CHEM 127, MATH 141, PHYS 131, or PHYS 141.

Introduction to learning theory and teaching practices for mathematics and science learning assistants regarding conceptual development, questioning techniques, cooperative learning, nature of math and science, and argumentation in mathematics and science. Restricted to students admitted to the Learning Assistant program. 2 seminars.

SCM 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

Science and Mathematics (SCM)

SCM 300. Early Field Experience. 4 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing; for Math majors or Science and Engineering majors only.

Historical, philosophical, and social foundations of public science and mathematics education. Public school curriculum and professional education dispositions. Structured observation and participation in K-12 public schools with attention to instructional practices for diverse learners. Credit/No Credit grading only. 2 lectures, 2 activities.

SCM 301. Professional School Preparation for Health Profession Careers. 1 unit

CR/NC

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; minimum of 3.0 CPSLO GPA; and consent of instructor.

Recommended: SCM 101 and completion of GWR.

Application strategies and preparation for health professions programs. Analysis of the application requirements and critique of personal application components. Credit/No Credit grading only. 1 activity.

SCM 302. The Learn By Doing Lab Teaching Practicum. 2 units

CR/NC

Term Typically Offered: W, SP

Prerequisite: Completion of GE Area B.

Early teaching experience in an informal science, technology, engineering, and mathematics (STEM) teaching and learning environment. Principles of inquiry-driven STEM education, lesson design, implementation and assessment. Intended for undergraduates exploring STEM teaching as a career. Total credit limited to 4 units. Credit/No Credit grading only. 1 seminar, 1 laboratory. Crosslisted as ENGR 322/SCM 302/HNRS 302.

SCM 320. Technology in London. 4 units

GE Area F

Term Typically Offered: SU

Prerequisite: Junior standing and completion of GE Area B. Concurrent: Enrollment in London Study Program.

Impact of one or two technologies in modern London. Development of the technology from the scientific/industrial revolution, as seen through London museums and industries. Technological solutions to modern problems, and their dependence on available technology. Field trips required. The Schedule of Classes will list topic selected. 2 lectures, 2 activities. Fulfills GE Area F.

SCM 335. Nuclear Science and Society. 4 units

GE Area F

Term Typically Offered: F, W, SP

Prerequisite: Junior standing and completion of GE Area B.

Impact of nuclear phenomena on energy production, warfare, health and medicine, and the environment. Scientific and public policy aspects of reactor design, nuclear accidents, disposal of radioactive waste, nuclear medicine, food irradiation, nuclear weapons, and fusion as potential energy source. 4 lectures. Fulfills GE Area F.

SCM 350. The Global Environment. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area B.

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/ historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 4 lectures. Crosslisted as AG/EDES/ENGR/GEOG/ISLA/SCM/UNIV 350. Fulfills GE Area F.

SCM 360. Selected Environmental Issues of California's Central Coast. 4 units

GE Area F

Term Typically Offered: SP

Prerequisite: Completion of GE Area B; and junior standing.

Examination of several inter-related environmental issues currently affecting California's Central Coast region. Focuses on the role of technology in creating/mitigating environmental problems. Field trips required. 3 lectures, 1 activity. Fulfills GE Area F.

SCM 363. Public Health Fieldwork. 2 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; must have been enrolled at Cal Poly for at least two quarters; consent of instructor.

Structured observational experiences for pre-health students at the County Health Agency. Designed to promote awareness and understanding of public health careers, as well as provide practical experience. Limited space availability. Application process for enrollment available from CSM Advising Office. Total credit limited to 6 units. Credit/No Credit grading only.

SCM 451. Ethics in the Sciences. 3 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

The practice, performance and application of science from the standpoint of ethics. Includes issues involving plagiarism, data handling, fraud, safety and selected applications in specific science careers. Models for the analysis and resolution of ethical dilemmas are presented. 3 seminars. Crosslisted as PHIL/SCM 451.

SCM 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

SCM 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

Social Sciences (SOCS)

SOCS Courses

SOCS 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

SOCS 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

SOCS 440. Internship. 4-8 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Senior standing and/or consent of instructor.

Supervised training, research, and work in public and private organizations. Credit/No Credit grading only. Total credit limited to 18 units.

SOCS 461. Senior Project I. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

SOCS 462. Senior Project II. 2 units

Term Typically Offered: F, W, SP

Prerequisite: Senior standing.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

SOCS 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 12 units. Credit/No Credit grading only.

SOCS 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 4 units; total credit limited to 24 units. Credit/No Credit grading only.

Sociology (SOC)

SOC Courses

SOC 110. Comparative Societies. 4 units

GE Area D3

Term Typically Offered: F, W, SP

Introduction to sociological theory and methods, emphasizing a comparative analysis of social institutions of contemporary societies in major world regions, including the family, religion, politics, and the economy. Direct comparisons made between American social institutions and those of other societies, their histories, social problems and social change. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE D3.

SOC 111. Social Problems. 4 units

Term Typically Offered: F, W

An introduction to sociology with an emphasis on problems inherent in selected social institutions. Instruction in social analysis, including theories of social problems, how those problems are studied, and a survey of possible solutions. 4 lectures.

SOC 200. Special Problems for Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

SOC 218. International Political Economy. 4 units

GE Area D2

Term Typically Offered: W, SP

Principles of international political economy in their social and cultural context. Sociological perspectives on the historical development of the world system and the current patterns of global inequality. Comparison of the political economy of major nations and their relation to the overall world system. 4 lectures. Fulfills GE D2.

SOC 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

SOC 301. Social Work and Social Welfare Institutions. 4 units

Term Typically Offered: F

Prerequisite: SOC 110. Recommended: Junior standing.

Introduction to the field of social welfare. Development of social work and social welfare services; major issues in social service policy. Scope and diversity of specific programs in the social services. Analysis of current programs and the recipients of welfare services. 4 lectures.

SOC 305. Social Movements. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing. Recommended: SOC 110, SOC 111.

Description and analysis of social movements in contemporary societies as they relate to major revolutionary changes historically and in the present. Analysis of variables producing social movements and political violence, including terrorism. Impact on society. 4 lectures.

SOC 306. Sociology of the Family. 4 units

Term Typically Offered: SP

Prerequisite: SOC 110. Recommended: Junior standing.

Description and analysis of family relationships; role of family in society, effects of society on family economy, structure and change. Other topics include courtship, marriage, parenting, divorce and alternative family forms. 4 lectures.

SOC 309. The World System and Its Problems. 4 units

Term Typically Offered: SP

Prerequisite: SOC 110. Recommended: Junior standing.

Analysis of the historical background, structure, and dynamics of the world system; examines such issues as the origins of Third World poverty, colonialism, the changes in the world's dominant economic powers, the fall of communism, the growing economic competition between Europe, North America, and Asia; and possible strategies for the economic development of the Third World. 4 lectures.

SOC 310. Self, Organizations and Society. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Analysis of the interactions relating to the development of self. Examination of the reciprocal interactions between biology, personal environment, and society. 4 lectures.

SOC 311. Sociology of Gender. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing.

Analysis of social constructions of sex and gender. Explores how gender stereotypes are created and reproduced. Focus on media representations; intersections of gender, race, class, sexuality; and effects on individuals and structures of work, education, family, and abusive relationships. 4 lectures. Crosslisted as SOC/WGS 311.

SOC 313. Urban Sociology. 4 units

Term Typically Offered: TBD

Prerequisite: SOC 110. Recommended: Junior standing.

Description of the context of urban development; analysis of various forces generating urbanization. Investigation of urban models and spatial relationships; urban processes; and problems. 4 lectures.

SOC 315. Global Race and Ethnic Relations. 4 units

GE Area D5

Term Typically Offered: F, SP

Prerequisite: Completion of GE Area A with a grade of C- or better; GE Area D3; and junior standing.

Diverse structures of unequal relationships among racial and ethnic groups in several countries including the United States. Theories about sources of economic and social discrimination and colonialism. Focus on the concept of ethnicity. Evaluation methods to restructure race and ethnic relations. International case histories. 4 lectures. Fulfills GE D5 except for Social Sciences or Sociology majors.

SOC 316. American Ethnic Minorities. 4 units

USCP

Term Typically Offered: W, SP

Prerequisite: Junior standing.

Exploration of the issues and problems facing the four major ethnic minorities in American society: Native Americans, Afro-Americans, Hispanics and Asian Americans. Dynamics of intergroup relations focusing on the concepts of ethnocentrism, stereotyping, pluralism and assimilation. Sources and manifestations of economic and social discrimination patterns and how they affect the individual's life course. 4 lectures. Fulfills USCP.

SOC 323. Social Stratification. 4 units

Term Typically Offered: F, W

Prerequisite: Junior standing.

Social class and the distribution of income, wealth, status and power in society, with emphasis on contemporary United States; social mobility; race, gender, and ethnic inequalities; political power and the nature of welfare; the nature, causes and solutions to poverty. A comparative perspective also taken with a focus on Japan and Europe. 4 lectures.

SOC 326. Sociology of the Life Cycle. 4 units

GE Area D5

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area D3.

Change and continuity of the self through the life course. Impact of aging on the physical, emotional, intellectual and social aspects of well being, and how this knowledge can be applied to enhance the quality of life. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE D5 except for Social Sciences or Sociology majors.

SOC 327. Social Change. 4 units

GE Area D5; USCP

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE area A with a grade of C- or better; completion of one lower-division course in GE area D. Recommended: HIST 216 or SOC 305.

Compares and contrasts social change strategies over time and across diverse social problems, focusing mainly on the U.S., but not exclusively. Theoretical and critical examination of contemporary efforts to address restricted opportunities by groups who have been historically marginalized due to race/ethnicity, lower socioeconomic status, sexuality, or other social identities. 4 lectures. Fulfills GE D5 except for Sociology majors. Fulfills USCP.

SOC 350. Social Organization of Modern Japan. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

Social and cultural features of modern Japan. Japanese group processes. Investigation of contemporary Japanese institutions: family, education, mass media, industry, politics, including an overview of popular culture. 4 lectures.

SOC 354. Qualitative Research Methods. 4 units

Term Typically Offered: F, W, SP

Prerequisite: STAT 217 with a C- or better and two sociology courses, or consent of instructor.

Qualitative data collection for social research. The relationship among theory research and hypothesis testing. Data collection techniques, including content analysis, face to face interviews, and ethnographic methods. 3 lectures, 1 activity.

SOC 355. Quantitative Research Methods. 4 units

Term Typically Offered: F, W, SP

Prerequisite: STAT 217 and Junior standing.

The basics of how to do quantitative social research. Includes topics on data collection techniques such as surveys, experiments, and the use of existing data. Also includes topics on univariate, bivariate, and multivariate analysis and the use of SPSS for data analysis. 3 lectures, 1 activity.

SOC 377. Sociology of Religion. 4 units

GE Area D5

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and two courses from two categories in Area D.

Religion from a sociological perspective. Topics may include the nature of religious experience, the role of religion in politics, economics, and social change, and the role that social forces have in influencing religious beliefs and practices. 4 lectures. Fulfills GE D5 except for Social Sciences or Sociology majors.

SOC 395. Sociology of Complex Organizations. 4 units

Term Typically Offered: F, SP

Prerequisite: Junior standing.

Bureaucracies and informal organizations from a sociological perspective. Organizational networks within and between organizations, relationship between organizations and their environment, and organizational socialization and career patterns, and gender and race or ethnic differences in organizational patterns. 4 lectures.

SOC 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of department head.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter.

SOC 402. Crime and Violence. 4 units

Term Typically Offered: F

Prerequisite: Junior standing.

Criminal behavior of individuals and groups; special categories include drug use, sex offenders, property crime, syndicated crime, interpersonal violence, and white-collar criminality. Legal definitions of crime and their implications, theories of causation, the sources of criminological data, and possible responses to the problems posed by criminal behavior. 4 lectures.

SOC 406. Juvenile Justice and Delinquency. 4 units

Term Typically Offered: SP

Prerequisite: One course in sociology.

Sociological examination of juvenile delinquency as a social and legal concept, covering the nature, volume and social distribution of juvenile crime; the formal structure of juvenile justice; and how justice for juveniles is applied in practice. 4 lectures.

SOC 412. Criminology & Criminal Justice. 4 units

Term Typically Offered: TBD

Prerequisite: Junior standing.

A sociological perspective of contemporary crime and criminal justice issues, such as racial profiling, drug enforcement, and mass incarceration. Incorporates criminological theory to examine the nature, function, and causes of crime in society. Focuses on the control and treatment strategies of adult offenders. 4 lectures.

SOC 413. Methods of Social Work. 4 units

Term Typically Offered: SP

Prerequisite: SOC 301 and junior standing.

Skills, values and knowledge emphasized in social work. The generic perspective. Methods in social case work, group work, community organization, and social action. Alternative models. Settings of social work practice. Discussion of case material and professional literature. Case work management. Traditional and innovative therapy techniques. 4 seminars.

SOC 421. Social Theory. 4 units

Term Typically Offered: F, W

Prerequisite: SOC 111.

Concepts and theories in sociology. Development and history of social theory in the classical period. Development of the predominant perspectives in sociology: positivist/functionalist, conflict, symbolic interactionist. Importance of theories for understanding of present social arrangements and problems. 4 lectures.

SOC 431. World Population Processes and Problems. 4 units

Term Typically Offered: F

Prerequisite: SOC 110 or ANT 201. Recommended: SOC 354; SOC 355; or ANT/GEOG 455.

Introduction to demography, emphasizing historical patterns and impacts of population change. Is population a problem? Topics include fertility, mortality, the demographic transition, food security, environmental degradation, population control, population aging, intergenerational transfers, and migration. 4 lectures.

SOC 440. Internship. 2-8 units

CR/NC

Term Typically Offered: TBD

Prerequisite: Senior standing and/or consent of instructor.

Supervised training, research, and work in public and private organizations. Credit/No Credit grading only. Total credit limited to 12 units.

SOC 444. Incarceration and Society: Perspectives on the Criminal Justice System. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing, SOC 402 or SOC 412, and consent of instructor.

Compares and contrasts perspectives on the criminal justice system in dialogue with inmates. Examination of the social construction of deviance and inequality in the life course that may lead to incarceration. 3 lectures, 1 activity.

SOC 461. Senior Project I. 2 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

SOC 462. Senior Project II. 2 units

Term Typically Offered: TBD

Prerequisite: Senior standing.

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

SOC 464. Professional Development for Sociologists. 1 unit

CR/NC

Term Typically Offered: TBD

Prerequisite: SOC 110 and Junior standing.

Preparation for professional advancement in the field of Sociology. Supervised career planning emphasizing resume development, selection of an internship or international experience, exploration of career options and graduate programs. Lectures from outside, practicing professionals. 1 lecture. Credit/No Credit grading only.

SOC 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

Soil Science (SS)

SS Courses

SS 121. Introductory Soil Science. 4 units

GE Area B5

Term Typically Offered: F, W, SP

Prerequisite: College chemistry; and passing score on ELM examination or an ELM exemption or MATH 96 (formerly MATH 104) or MATH 115 or appropriate Math Placement Level.

Biological, chemical, physical and genetic properties of soils. Application of scientific principles to solving land use, water management, and soil conservation problems. Interpretation of soils data for making environmental decisions, applying management practices, and sustainable food production. 3 lectures, 1 laboratory. Fulfills GE Area B5.

SS 131. Soils in Environmental and Agricultural Systems. 4 units

Term Typically Offered: TBD

Soils' ecological functions; soil and the water cycle; soil in production of food, fiber, and forest materials; techniques and reports of soil analyses with agricultural and environmental applications; soil quality; introductory overview of soils and civilizations. Not open to students with credit in SS 121. 3 lectures, 1 activity.

SS 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 12 units, with a maximum of 2 units per quarter. Crosslisted as ERSC/SS 200.

SS 221. Soil Health and Plant Nutrition. 4 units

Term Typically Offered: F, W, SP

Prerequisite: SS 121.

Plant nutrient requirements in the context of soil health. Composition, value, and use of fertilizer materials, conditioners and agricultural minerals for sustainable crop production and environmental quality. 3 lectures, 1 laboratory.

SS 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 lectures. Crosslisted as ERSC/SS 270.

SS 301. Earth Sciences/Soils Science Practicum. 1-2 units

CR/NC

Term Typically Offered: TBD

Prerequisite: SS 110 or SS 121.

Supervised practice in technical, educational, professional, and operational applications related to earth sciences or soil science. Students participate in faculty-supervised group or individual activities that support educational and professional goals. Credit/No Credit grading only. Total credit limited to 12 units. 1-2 activities. Crosslisted as ERSC/SS 301.

SS 321. Soil Morphology. 4 units

Term Typically Offered: F, W, SP

Prerequisite: SS 121.

Identification of soil morphological and site properties. Correlation of soil physical and chemical properties with soil taxonomy and land use. Techniques of interpretations for agriculture, forest lands, wetlands, range lands and urban development. 3 lectures, 1 laboratory.

SS 322. Soil Plant Relationships. 4 units

Term Typically Offered: W

Prerequisite: SS 221, CHEM 111 or CHEM 128.

Investigation and evaluation of the nutrient supplying ability of soils. Conditions and transformations involved in the transfer of mineral nutrients from soils to plants. Effects of cultural treatments on soil fertility. Diagnostic techniques and data interpretation in soil and plant analysis. 3 lectures, 1 laboratory.

SS 339. Internship in Environmental Earth and Soil Sciences. 1-12 units
CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of internship instructor.

Selected students will spend up to 12 weeks with an approved firm or agency engaged in work and study related to their major. A detailed written proposal and written interim and final reports required. One unit of credit may be allowed for each full week of internship. Credit/No Credit grading. Crosslisted as ERSC/SS 339.

SS 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 12 units. Crosslisted as ERSC/SS 400.

SS 402. Soil, Compost, and Water Testing Enterprise. 3 units

Term Typically Offered: TBD

Prerequisite: CHEM 111, CHEM 125 or CHEM 128; SS 221; and junior standing.

Experience in soil, compost, and water testing. Sampling rationale and protocol. Analyses of compost feedstocks and finished compost; monitoring for consistency. Theory and practice in use of analytical instrumentation. Interpretation of results for soil, compost, and water management. Total credit limited to 6 units for SS or ERSC majors. Total credit limited to 3 units for Soil Science minor.

SS 421. Wetlands. 4 units

Term Typically Offered: W

Prerequisite: BOT 121 or BIO 162, CHEM 111 or CHEM 127, and SS 121 or SS 131. Recommended: one of the following: BIO 327, BOT 313, BOT 326, MSCI 328 or NR 306.

The formation, characteristics, and functions of wetlands. Genesis of hydric soils. Plant adaptations to saturated soils. Wetlands as wildlife habitat. Policies and social issues associated with wetlands. The procedures of wetland delineations. 3 lectures, 1 laboratory. Crosslisted as BIO/NR/SS 421.

SS 422. Soil Ecology. 4 units

Term Typically Offered: SP

Prerequisite: CHEM 212, CHEM 312, or CHEM 313; and SS 221; or graduate standing.

Biochemical activities, ecology and environmental implications of soil organisms. Effects on the formation, characteristics, and productivity of soils. Methods of studying soil organisms. 3 lectures, 1 laboratory.

SS 423. Environmental Soil and Water Chemistry. 5 units

Term Typically Offered: F

Prerequisite: CHEM 129; CHEM 212, CHEM 216, CHEM 312, or CHEM 316; ERSC 223; MATH 118, MATH 141, or MATH 161; or graduate standing.

Chemical processes governing weathering, soil mineral formation and stability, common solubility equilibria. Use of chemical principles to explain surface chemical properties of soils and environmental problems in water and soil chemical systems. Preparation of professional quality reports based on laboratory data and library research. 3 lectures, 1 laboratory, 1 activity.

SS 431. Digital Soil Mapping. 4 units

Term Typically Offered: F

Prerequisite: GEOG 318 or LA/NR 218; SS 321; STAT 217 or STAT 218; or graduate standing.

Development and production of digital soil surveys for interpretive purposes. Use of soil taxonomy, land classification systems, geographic information system (GIS) software, and geostatistics to evaluate land for best management practices. 2 lectures, 2 laboratories.

SS 432. Environmental Soil Physics. 5 units

Term Typically Offered: W

Prerequisite: CHEM 128; MATH 141 or MATH 161; PHYS 121 or PHYS 141; SS 121; or graduate standing.

Matter and energy in soils, with emphasis on properties and behavior of solids, water, air, and heat. Applications to agriculture, forestry, range management, engineering, and environmental sciences. Preparation of professional reports based on laboratory data and library research. 3 lectures, 1 laboratory, 1 activity.

SS 440. Forest and Range Soils. 4 units

Term Typically Offered: F

Prerequisite: SS 121, SS 321 or consent of instructor.

Ecosystem approach to chemical, biological, physical and mechanical properties of forest and range soils. Site quality, nutrient cycling, erosion and mass movement, fire effects. Preparation of soil management reports similar to those required by various land management organizations. Overnight field trips. 3 lectures, 1 laboratory.

SS 442. Vadose Zone and Groundwater Processes. 4 units

Term Typically Offered: SP

Prerequisite: CHEM 212, CHEM 216, or CHEM 312; GEOL 201; MATH 161 or MATH 141; and SS 121.

Vadose zone and groundwater modeling and monitoring for groundwater basin management. Principles of saturated and unsaturated flow. Fate and transport of contaminants in soils and subsurface porous media. Soil remediation and reclamation of disturbed lands. 3 lectures, 1 laboratory.

SS 444. Soil Judging. 2 units

Term Typically Offered: W, SP

Prerequisite: SS 321.

Morphological description of soils in the field. Taxonomic determination of classifications and interpretive properties from soil descriptions. Participation in collegiate soil judging contests. Total credit limited to 12 units. 1 lecture, 1 laboratory.

SS 463. Undergraduate Seminar. 2 units

Term Typically Offered: SU

Prerequisite: SS 461.

Review of current research, experiments, and problems related to the student's major field of interest. Preparation and presentation of reports on problems or research activities. 2 seminars.

SS 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 12 units. 1 to 4 lectures. Crosslisted as ERSC/SS 470.

SS 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories. Crosslisted as ERSC/SS 471.

SS 500. Individual Study in Soil Science. 1-6 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Consent of instructor.

Advanced independent study planned and completed under the direction of a member of the Earth and Soil Sciences faculty. Total credit limited to 6 units.

SS 501. Research Planning. 4 units

Term Typically Offered: W

Prerequisite: Graduate standing or consent of instructor.

Problem solving and research planning for agriculture, natural resources and related sciences. Preparation of study plans that identify problems, review appropriate literature, formulate objectives, develop methods and provide for presentation and interpretation of results. Oral reports. 4 lectures.

SS 508. Environmental Assessment for Erosion Control. 3 units

Term Typically Offered: TBD

Prerequisite: SS 121 or equivalent and graduate standing, or consent of instructor.

Assessment techniques for the development of soil erosion control and the dispersal of surface runoff water on urban, agriculture, riparian, and rangelands. Development of a water quality management plan for a specific land use. 3 lectures.

SS 522. Advanced Soil Fertility. 3 units

Term Typically Offered: TBD

Prerequisite: SS 322, graduate standing or consent of instructor.

Current research frontiers in soil fertility. Evaluating soil testing philosophy, theories and interpretation. Optimizing soil conditions for maximizing crop production. Consequences of environmental pollution, trace elements and organic amendments. Chemical reactions including solubility and chelate equilibria, adsorption phenomena, nutrient mobility, soil mineralogy and weathering. Use of foliar fertilization. Radioisotopes in soil fertility. 3 lectures.

SS 570. Selected Topics in Soil Science. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 12 units. 1 to 4 seminars.

SS 571. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 laboratories.

SS 581. Graduate Seminar in Environmental Sciences. 3 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Student study and presentation of selected developments, trends and problems in the field of forest and natural resources, earth and soil sciences, and environmental management. 3 seminars. Crosslisted as NR/SS 581.

SS 582. GIS in Advanced Land Management. 3 units

Term Typically Offered: TBD

Prerequisite: Graduate standing, NR/LA 318, or consent of instructor.

Development of plans and practices for the management of crop, range, urban and wood land. 2 seminars, 1 laboratory.

SS 599. Thesis. 1-6 units

Term Typically Offered: F,W,SP,SU

Prerequisite: Graduate standing and consent of instructor.

Individual research in soil science under faculty supervision, leading to a scholarly written presentation exhibiting originality, clarity, critical and independent thinking, proper analysis of data, appropriate organization and format, and accurate and thorough documentation. Six units required for the M.S. degree.

Spanish (SPAN)

SPAN Courses

SPAN 101. Elementary Spanish I. 4 units

Term Typically Offered: F, W, SP

Beginning Spanish. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and conversation. Language taught in its intercultural context. Credit not available for students who have completed SPAN 104 or SPAN 111. 3 lectures, 1 activity.

SPAN 102. Elementary Spanish II. 4 units

Term Typically Offered: F, W, SP

Prerequisite: SPAN 101, SPAN 111, or appropriate score on placement exam or consent of instructor.

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and conversation. Language taught in its intercultural context. Not open to students with credit in SPAN 104. To be taken in numerical sequence. 3 lectures, 1 activity.

SPAN 103. Elementary Spanish III. 4 units

Term Typically Offered: F, W, SP

Prerequisite: SPAN 102 or appropriate score on placement exam or consent of instructor.

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and conversation. Language taught in its intercultural context. Not open to students with credit in SPAN 104. To be taken in numerical sequence. 3 lectures, 1 activity.

SPAN 104. Intensive Elementary Spanish. 12 units

Term Typically Offered: TBD

Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and conversation. Language taught in its intercultural context. Offered in summer only. Not open to students who have credit in SPAN 102 and/or SPAN 103. 9 lectures, 3 activities.

SPAN 111. Elementary Hispanic Language and Culture. 4 units

USCP

Term Typically Offered: F, W

Beginning Spanish. Class practice and assigned outside work in pronunciation, sentence structure, reading, writing, and conversation with special focus on vocabulary and culture from American agribusiness and the Hispanic cultures of the United States and Latin America. Not open to students who have credit in SPAN 101. 3 lectures, 1 activity. Fulfills USCP.

SPAN 201. Intermediate Spanish I. 4 units

GE Area C5

Term Typically Offered: F, W, SP

Prerequisite: SPAN 103 or appropriate score on placement exam or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in Spanish within an intercultural context. To be taken in numerical sequence. Not open to students with credit in SPAN 204. 3 lectures, 1 activity. Fulfills GE C5.

SPAN 202. Intermediate Spanish II. 4 units

GE Area C5

Term Typically Offered: F, W, SP

Prerequisite: SPAN 201 or appropriate score on placement exam or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in Spanish within an intercultural context. To be taken in numerical sequence. Not open to students with credit in SPAN 204. 3 lectures, 1 activity. Fulfills GE C5.

SPAN 203. Intermediate Spanish III. 4 units

GE Area C5

Term Typically Offered: F, W, SP

Prerequisite: SPAN 202 or appropriate score on placement exam or consent of instructor.

Development of presentational, interpersonal, and interpretive intermediate-level language skills in Spanish within an intercultural context. To be taken in numerical sequence. Not open to students with credit in SPAN 206. 3 lectures, 1 activity. Fulfills GE C5.

SPAN 206. Spanish for Heritage Speakers. 4 units

USCP

Term Typically Offered: SP

Prerequisite: SPAN 202 or appropriate score on placement exam or consent of instructor.

Focus on the grammatical, cultural and linguistic needs of students who grew up speaking Spanish in their homes/communities, but whose schooling has been primarily in English. Emphasis on reading and writing skills, vocabulary and spelling as well as on cultural understanding. Not open to students with credit in SPAN 203. 3 lectures, 1 activity. Fulfills USCP.

SPAN 207. Introduction to Spanish Linguistics. 4 units

Term Typically Offered: F

Prerequisite: SPAN 203, SPAN 206, or consent of instructor.

Introduction to the scientific study of the Spanish language with an overview of theoretical and applied linguistics and special emphasis on Spanish phonetics and phonology. Conducted in Spanish. 3 lectures, 1 activity.

SPAN 233. Introduction to Hispanic Readings. 4 units

GE Area C1

Term Typically Offered: F, W, SP

Prerequisite: Completion of GE Area A with a grade of C- or better; and SPAN 203 or SPAN 206.

Selected readings from Hispanic authors that show the Hispanic literary tradition from the Middle Ages to the present in Spain, Latin America, and of Latino/a writers in the United States. May include film and other media. Conducted in Spanish. 4 lectures. Fulfills GE C1.

SPAN 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics. Open only to undergraduate students. The Schedule of Classes will list topic selected. Conducted in Spanish. Total credit limited to 8 units. 1 to 4 lectures.

SPAN 301. Advanced Composition in Spanish. 4 units

Term Typically Offered: F, W, SP

Prerequisite: SPAN 203, SPAN 206 or consent of instructor.

Oral and written development of structural grammar, syntax, and complex components of Spanish. Vocabulary expansion and idiomatic construction. Written compositions. May include Spanish/English translation. Conducted in Spanish. 4 lectures.

SPAN 302. Advanced Conversation and Composition in Spanish. 4 units

Term Typically Offered: F, W, SP

Prerequisite: SPAN 203, SPAN 206, or consent of instructor.

Formal discussion of, and writing on selected cultural topics from the Spanish-speaking world. Focus on individual and group presentations and in-class writing and speaking assignments to enhance students' vocabulary and critical thinking skills in Spanish. Conducted in Spanish. 3 lectures, 1 activity.

SPAN 303. Introduction to English-Spanish Translation. 4 units

Term Typically Offered: F, W

Prerequisite: Completion of GE Area A with a grade of C- or better; and SPAN 207 or SPAN 233 or SPAN 301 or SPAN 302 or consent of instructor.

Developing basic knowledge, skills, theories and techniques required for translation both from Spanish to English and from English to Spanish. Translating news articles, legal documents, commercial advertisements, formal letters, and literary works. Conducted in Spanish. 4 lectures.

SPAN 305. Significant Works in Spanish. 4 units

GE Area C4

Term Typically Offered: F, W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and SPAN 233 or consent of instructor.

Critical analysis and oral discussion of poetry, essays, novels, plays, films, and other media by selected Hispanic authors. Conducted in Spanish. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 4 lectures. Fulfills GE C4 except for Modern Languages and Literatures majors.

SPAN 307. Spanish and Latin American Film. 4 units

GE Area C4

Term Typically Offered: W, SU

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and SPAN 233 or consent of instructor.

Study, analysis, and critique of films from Spain and/or Latin America, organized around such topics as individual film directors or genres, national and international film traditions, migration, gender, ethnicity, and politics. Evaluation of works in their cultural contexts. The Schedule of Classes will list topic selected and language of instruction (English or Spanish). Total credit limited to 8 units. Course may be offered in classroom-based or online format. 3 lectures, 1 activity. Fulfills GE C4 except for Modern Languages and Literatures majors.

SPAN 340. Chicano/a Authors. 4 units

GE Area C4; USCP

Term Typically Offered: W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and SPAN 233.

Introduction to Chicano/a literary accomplishments to facilitate appreciation of Chicano/a literary aesthetics and increase understanding of Chicano/a cultural values and lifestyles. Conducted in Spanish. 4 lectures. Fulfills GE C4 except for Modern Languages and Literatures majors. Fulfills USCP.

SPAN 350. Hispanic Literature in English Translation. 4 units

GE Area C4

Term Typically Offered: W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course in Area C1.

Selected works to be read by students in English translation. Critical analysis, interpretation, and comparison of works by Hispanic authors. Course may include film and other media. Discussion in English. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Fulfills GE C4 except for Modern Languages and Literatures majors.

SPAN 351. Chicano/Latino Writers in the United States. 4 units

GE Area C4; USCP

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course in Area C.

Analysis and exploration of the major themes of Chicano/Latino literature in the United States today. Emphasis on Chicano/a, Puerto Rican, Cuban American and other U.S. Latino/a writers. All readings and discussions in English. 4 lectures. Fulfills GE C4 except for Modern Languages and Literatures majors. Fulfills USCP.

SPAN 390. Introduction to Creative Writing in Spanish. 4 units

Term Typically Offered: SP

Prerequisite: SPAN 301 or consent of instructor.

Directed practice with writing narrative, poetry and/or drama writing in Spanish. An examination of plot, character and theme development. Crafting of creative literature for potential publication. Conducted in Spanish. 4 lectures.

SPAN 402. Advanced Topics in Spanish Linguistics. 4 units

Term Typically Offered: W

Prerequisite: SPAN 207.

Advanced study of Spanish linguistics. Topics include bilingualism and code-switching, sounds and pronunciation, word formation, grammatical structures, meaning and intention. Introduction to research methodologies in the social sciences to discuss issues of Spanish in the US, identity, race, and migration. Conducted in Spanish. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

SPAN 410. Advanced Literature in Spanish. 4 units

Term Typically Offered: F

Prerequisite: SPAN 233 or consent of instructor.

In-depth study of literature in Spanish. Specific genre, literary period, authorial group, region, or country. Chicano/Latino literature, Latin American literature, and Spanish literature. Course may include film and other media. Conducted in Spanish. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

SPAN 416. Don Quixote. 4 units

Term Typically Offered: SP

Prerequisite: SPAN 233 or consent of instructor.

Intensive reading of Cervantes' novel, Don Quixote (Part 1, 1605 and Part 2, 1615) in the context of Cervantes' life and the history and social context of Spanish renaissance and baroque culture. Conducted in Spanish. 4 lectures.

SPAN 470. Selected Advanced Topics. 4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Conducted in Spanish. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures.

Statistics (STAT)

STAT Courses

STAT 130. Statistical Reasoning. 4 units

GE Area B1

Term Typically Offered: F, W, SP

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level.

Survey of statistical ideas and philosophy. Emphasis on concepts rather than in-depth coverage of statistical methods. Topics include sampling, experimentation, data exploration, chance phenomena, and methods of statistical inference. Not open to students with credit in any statistics course. 4 lectures. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

STAT 150. Introduction to the Discipline of Statistics. 2 units

Term Typically Offered: F

Prerequisite: freshman and statistics major.

Orientation to the statistics program, introduction to the discipline of statistics, including the development of the discipline, professional ethics, data visualization and the role of statistics in the scientific enterprise. 2 lectures.

STAT 200. Special Problems for Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

STAT 217. Introduction to Statistical Concepts and Methods. 4 units

GE Area B1

Term Typically Offered: F,W,SP,SU

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level.

Sampling and experimentation, descriptive statistics, confidence intervals, two-sample hypothesis tests for means and proportions, Chi-square tests, linear and multiple regression, analysis of variance. Substantial use of statistical software. Not open to students with credit in STAT 218 or STAT 251. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

STAT 218. Applied Statistics for the Life Sciences. 4 units

GE Area B1

Term Typically Offered: F,W,SP,SU

Prerequisite: Passing score on ELM examination; or an ELM exemption; or MATH 96 (formerly MATH 104); or MATH 115; or appropriate Math Placement Level.

Data collection and experimental design, descriptive statistics, confidence intervals, parametric and non parametric one and two-sample hypothesis tests, analysis of variance, correlation, simple linear regression, chi-square tests. Applications of statistics to the life sciences. Substantial use of statistical software. Not open to students with credit in STAT 217 or STAT 251. 4 lectures. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

STAT 251. Statistical Inference for Management I. 4 units

GE Area B1

Term Typically Offered: F, W, SP

Prerequisite: Completion of ELM requirement and passing score on appropriate Mathematics Placement Examination; or appropriate Math Placement Level; or MATH 118.

Descriptive statistics. Probability and counting rules. Random variables and probability distributions. Sampling distributions and point estimation. Confidence intervals and tests of hypotheses for a single mean and proportion. 4 lectures. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

STAT 252. Statistical Inference for Management II. 5 units

GE Area B1

Term Typically Offered: F, W, SP

Prerequisite: STAT 251 with a minimum grade of C- or consent of instructor.

Confidence intervals and tests of hypotheses for two means and two proportions. Introduction to ANOVA, regression, correlation, multiple regression, time series, and forecasting. Statistical quality control. Enumerative data analysis. Substantial use of statistical software. Course may be offered in classroom-based or online format. 5 lectures. Fulfills GE B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE B1 course is required to fulfill GE Area B.

STAT 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

STAT 301. Statistics I. 4 units

Term Typically Offered: F, W

Prerequisite: MATH 141.

Introduction to statistics for mathematically inclined students, focused on process of statistical investigations. Observational studies, controlled experiments, randomization, confounding, randomization tests, hypergeometric distribution, descriptive statistics, sampling, bias, binomial distribution, significance tests, confidence intervals, normal model, t-procedures, two-sample procedures. Substantial use of statistical software. 4 lectures.

STAT 302. Statistics II. 4 units

Term Typically Offered: W, SP

Prerequisite: STAT 301.

Continued study of the process, concepts, and methods of statistical investigations. Association, chi-square procedures, one-way ANOVA, multiple comparisons, two-way ANOVA with interaction, simple linear regression, correlation, prediction, multiple regression. Substantial use of statistical software. 4 lectures.

STAT 305. Introduction to Probability and Simulation. 4 units

Term Typically Offered: F, W

Prerequisite: one of the following: CPE/CSC 101, CSC 232, CPE/CSC 235, or STAT 331; and MATH 142.

Basic probability rules, counting methods, conditional probability. Discrete and continuous random variables, expected values, variance and covariance. Properties of linear combinations of random variables with applications to statistical estimators. Simulation analysis of random phenomena using a modern computer language. Not open to students with credit in STAT 321. 4 lectures.

STAT 312. Statistical Methods for Engineers. 4 units

GE Area B6

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 142.

Descriptive and graphical methods. Discrete and continuous probability distributions. One and two sample confidence intervals and hypothesis testing. Single factor analysis of variance. Quality control. Introduction to regression and to experimental design. Substantial use of statistical software. 4 lectures. Fulfills GE B6.

STAT 313. Applied Experimental Design and Regression Models. 4 units

GE Area B1

Term Typically Offered: F, W, SP

Prerequisite: STAT 217, STAT 218, STAT 312, or STAT 542; and MATH 118, or completion of the ELM requirement and passing score on the appropriate Mathematics Placement Examination, or appropriate Math Placement Level.

Analysis of variance and regression analysis for students not majoring in statistics or mathematics. Includes one-way classification, randomized blocks, Latin squares, factorial designs, multiple regression, diagnostics, and model comparison. 4 lectures. Fulfills GE Area B1; for students admitted Fall 2016 or later, a grade of C- or better in one GE Area B1 course is required to fulfill GE Area B.

STAT 321. Probability and Statistics for Engineers and Scientists. 4 units

GE Area B6

Term Typically Offered: F, W, SP

Prerequisite: MATH 142.

Tabular and graphical methods for data summary, numerical summary measures, probability concepts and properties, discrete and continuous probability distributions, expected values, statistics and their sampling distributions, point estimation, confidence intervals for a mean and proportion. Use of statistical software. 4 lectures. Fulfills GE B6.

STAT 323. Design and Analysis of Experiments I. 4 units

Term Typically Offered: W, SP

Prerequisite: IME 326 or STAT 252 or STAT 302 or STAT 312 or STAT 313.

Principles, construction and analysis of experimental designs. Completely randomized, randomized complete block, Latin squares, Graeco Latin squares, factorial, and nested designs. Fixed and random effects, expected mean squares, multiple comparisons, and analysis of covariance. 4 lectures.

STAT 324. Applied Regression Analysis. 4 units

Term Typically Offered: F, W, SP

Prerequisite: IME 326 or STAT 252 or STAT 302 or STAT 312 or STAT 313.

Linear regression including indicator variables, influence diagnostics, assumption analysis, selection of 'best subset', nonstandard regression models, logistic regression, nonlinear regression models. Not open to students with credit in STAT 334. 4 lectures.

STAT 330. Statistical Computing with SAS. 4 units

Term Typically Offered: F, W

Prerequisite: IME 326 or STAT 252 or STAT 302 or STAT 312 or STAT 313.

Data acquisition, cleaning, and management using SAS; reading data into SAS from various sources, recoding variables, subsetting and merging data, exporting results in other formats. Graphical procedures, basic descriptive and inferential statistics. Introduction to SAS macros. 4 lectures.

STAT 331. Statistical Computing with R. 4 units

Term Typically Offered: W, SP

Prerequisite: one of the following: IME 326, STAT 252, STAT 302, STAT 312, or STAT 313; and one of the following: BUS 290, CPE/CSC 101, CPE/CSC 235, ECON 395, or STAT 330.

Data acquisition, cleaning, and management in R; use of regular expressions; functional and object-oriented programming; graphical, descriptive, and inferential statistical methods; random number generation; Monte Carlo methods including resampling, randomization, and simulation. 4 lectures.

STAT 334. Applied Linear Models. 4 units

Term Typically Offered: W, SP

Prerequisite: one of the following: STAT 252, STAT 302, STAT 312, STAT 313, or IME 326; and one of the following: MATH 206, or MATH 244.

Linear models in algebraic and matrix form, diagnostics, transformations, polynomial models, categorical predictors, model selection, correlated errors, logistic regression. Not open to students with credit in STAT 324. 4 lectures.

STAT 350. Probability and Random Processes for Engineers. 4 units

GE Area B6

Term Typically Offered: F, W, SP

Prerequisite: MATH 241, EE 228.

Random events, random variables, and random processes, with emphasis on probabilistic treatment of signals and noise. Specific topics include: sample spaces, probability, distributions, independence, moments, covariance, time/ensemble averages, stationarity, common processes, correlation and spectral functions. 4 lectures. Fulfills GE B6.

STAT 365. Statistical Communication. 2 units

Term Typically Offered: SP

Prerequisite: Completion of GE Areas A1 and A3 with a grade of C- or better; and one of the following: STAT 252, STAT 302, or STAT 313.

Written communication of statistical ideas and content. Analyze data using appropriate methods from previous statistics courses. Writing technical reports with appropriate graphs and tables. Strategies to discern relevant and necessary information to communicate data, ideas, and results to different audiences. 2 lectures.

STAT 400. Special Problems for Advanced Undergraduates. 1-2 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

STAT 405. Applied Probability Models. 4 units

Term Typically Offered: SP

Prerequisite: CPE/CSC 101 or CSC 232 or CPE/CSC 235; MATH 206 or MATH 244; and STAT 305 or STAT 350 or STAT 426.

Advanced probability models, their simulation and application. Poisson processes, Markov chains, random walks, and continuous-time Markov processes. Monte Carlo integration and simulation methods, including Markov chain Monte Carlo and Gibbs sampling. 4 lectures.

STAT 410. Statistics Education: Pedagogy, Content, Technology, and Assessment. 4 units

Term Typically Offered: SP

Prerequisite: one of the following: STAT 130, STAT 217, STAT 218, STAT 251, STAT 301, STAT 312, STAT 321, STAT 511, STAT 512 or STAT 542.

Topics related to content, pedagogy, technology, and assessment for teaching statistics in grades 6-16 in accordance with current standards and research for teaching statistics including the Common Core State Standards for Mathematics. 4 lectures.

STAT 414. Multilevel and Mixed Modeling. 4 units

Term Typically Offered: F

Prerequisite: STAT 324 or STAT 334 or STAT 524.

Overview of multilevel and mixed models, including hierarchical data, intraclass correlation, fixed vs. random coefficients, variance components, comparisons to traditional analyses. Use of statistical software for implementation of methods. 4 lectures.

STAT 415. Bayesian Reasoning and Methods. 4 units

Term Typically Offered: W

Prerequisite: one of the following: IME 326, STAT 252, STAT 302, STAT 312, STAT 313, or STAT 513; and one of the following: STAT 305, STAT 350, or STAT 425. Recommended: STAT 331.

Bayes' theorem, prior and posterior distributions, likelihood functions, Markov Chain Monte Carlo methods, hierarchical modeling. Bayesian data analysis, comparison of Bayesian and classical (frequentist) approaches. 4 lectures.

STAT 416. Statistical Analysis of Time Series. 4 units

Term Typically Offered: F

Prerequisite: STAT 324 or STAT 334 or STAT 524.

Time series components, descriptive smoothing methods, regression models for time series data, forecasting via exponential smoothing, evaluation of forecasts, autocorrelation, ARIMA models and Box-Jenkins methods, combining forecasts, frequency domain analysis, filtering. 4 lectures.

STAT 417. Survival Analysis Methods. 4 units

Term Typically Offered: W

Prerequisite: IME 326 or STAT 252 or STAT 302 or STAT 312 or STAT 313; and MATH 142.

Parametric and nonparametric methods for analyzing survival data. Topics include Kaplan-Meier and Nelson-Aalen estimates, Cox regression models, accelerated failure time models. Use of statistical software to implement methods throughout course. 4 lectures.

STAT 418. Categorical Data Analysis. 4 units

Term Typically Offered: W

Prerequisite: STAT 324 or STAT 334 or STAT 524.

Discrete multivariate statistics, including analysis of cross-classified data, log-linear models for multidimensional contingency tables, goodness of fit statistics, measures of association, model selection, and hypothesis testing. 4 lectures.

STAT 419. Applied Multivariate Statistics. 4 units

Term Typically Offered: SP

Prerequisite: One of the following: IME 326, STAT 252, STAT 302, STAT 312, STAT 313, STAT 513, or STAT 542; and one of the following: MATH 206, MATH 244, or graduate standing.

Continuous multivariate statistics. Multivariate linear model, principal components and factor analysis, discriminant analysis, clustering, classification, and canonical correlation. Use of statistical software throughout the course. 4 lectures.

STAT 421. Survey Sampling and Methodology. 4 units

Term Typically Offered: F

Prerequisite: IME 326 or STAT 252 or STAT 302 or STAT 312 or STAT 313 or STAT 511 or STAT 512 or STAT 513.

Survey planning, execution, and analysis. Principles of survey research, including non-sampling and sampling error topics. Survey sample designs, including simple random, systematic, stratified, cluster, and multi-stage. Estimation procedures and sample size calculations. 4 lectures.

STAT 423. Design and Analysis of Experiments II. 4 units

Term Typically Offered: SP

Prerequisite: STAT 323 or STAT 523.

Continuation of STAT 323. 2k factorial designs, 3k factorial designs, balanced and partially balanced incomplete block designs, nested designs, split-plot designs, response surface methodology, confounding, repeated measures, and other design approaches. 4 lectures.

STAT 425. Probability Theory. 4 units

Term Typically Offered: F

Prerequisite: MATH 241; and MATH 248 or CSC 348. Recommended: STAT 301 and STAT 305.

Basic probability theory, combinatorial methods, independence, conditional and marginal probability, probability models for random phenomena, random variables, probability distributions, distributions of functions of random variables, mathematical expectation, covariance and correlation, conditional expectation. 4 lectures.

STAT 426. Estimation and Sampling Theory. 4 units

Term Typically Offered: W

Prerequisite: STAT 425. Recommended: STAT 302.

Continuation of STAT 425. Properties of statistics obtained from samples. Sample mean properties, convergence in probability, law of large numbers, and central limit theorem. Selected probability distributions. Theory of estimation. Sampling distribution of estimators. 4 lectures.

STAT 427. Mathematical Statistics. 4 units

Term Typically Offered: SP

Prerequisite: STAT 426.

Continuation of STAT 426. The theory of hypothesis testing and its applications. Power and uniformly most powerful tests. Categorical data and nonparametric methods. Other selected topics. 4 lectures.

STAT 434. Statistical Learning: Methods and Applications. 4 units

Term Typically Offered: SP

Prerequisite: one of the following: STAT 324, STAT 334, or STAT 524.

Recommended: STAT 331 or STAT 531.

Modern methods in predictive modeling and classification. Splines, smoothing splines, ridge regression, LASSO, regression and classification trees, generalized additive models, logistic regression, and linear discriminant analysis. Model assessment and selection using cross validation, bootstrapping, AIC, and BIC. 4 lectures.

STAT 440. SAS Certification Preparation. 2 units

Term Typically Offered: W

Prerequisite: STAT 330.

Programming, data management, and data analysis in preparation for the Certified Base Programmer Exam offered by the SAS Institute. Topics include accessing data, creating data structures, managing data, generating reports, and handling errors. 2 lectures.

STAT 441. SAS Advanced Certification Preparation. 2 units

Term Typically Offered: SP

Prerequisite: STAT 440.

Programming topics in preparation for the Certified Advanced Programmer Exam offered by the SAS Institute. Accessing data using PROC SQL, macro processing, applications for indexes, data look-up techniques including array processing, hash objects, and combining/merging. 2 lectures.

STAT 461. Senior Project I. 1 unit

Term Typically Offered: F, W, SP

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 90 hours total time.

STAT 462. Senior Project II. 2 units

Term Typically Offered: F, W, SP

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 90 hours total time.

STAT 465. Statistical Consulting. 4 units

Term Typically Offered: SP

Prerequisite: STAT 365; Statistics major; and senior standing.

Blending of the theoretical and practical aspects of statistical consulting. Development of tools necessary to conduct effective consulting sessions, present oral arguments and written reports, work collaboratively to solve problems, and utilize professional publications in statistics. 4 lectures.

STAT 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1-4 lectures.

STAT 485. Cooperative Education Experience. 6 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Part-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 6 units; total credit limited to 12 units. Credit/No Credit grading only.

STAT 495. Cooperative Education Experience. 12 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Sophomore standing and consent of instructor.

Full-time work experience in business, industry, government, and other areas of student career interest. Positions are paid and usually require relocation and registration in course for two consecutive quarters. Formal report and evaluation by work supervisor required. Major credit limited to 12 units; total credit limited to 24 units. Credit/No Credit grading only.

STAT 511. Statistical Methods. 4 units

Term Typically Offered: F

Prerequisite: Graduate standing and intermediate algebra or equivalent.

Statistical methods in research for graduate students not majoring in mathematical sciences. Probability distributions, confidence intervals, hypothesis testing, contingency tables, linear regression and correlation, multiple regression, analysis of variance. Substantial use of statistical software. 4 lectures. Formerly STAT 512.

STAT 513. Applied Experimental Design and Regression Models. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Graduate standing and one of the following: STAT 217, STAT 218, STAT 252, STAT 312, STAT 511, STAT 512, or STAT 542.

Applications of statistics for graduate students not majoring in mathematics. Analysis of variance including the one-way classification, randomized blocks, Latin squares, and factorial designs. Introduction to multiple regression and to analysis of covariance. Substantial use of statistical software. 4 lectures. Not open to students with credit in STAT 313.

STAT 523. Design and Analysis of Experiments I. 4 units

Term Typically Offered: W, SP

Prerequisite: STAT 513 or STAT 542.

Principles, construction and analysis of experimental designs. Completely randomized, randomized complete block, Latin squares, Graeco-Latin squares, factorial, and nested designs. Fixed and random effects, expected mean squares, multiple comparisons, and analysis of covariance. Not open to students with credit in STAT 323. 4 lectures.

STAT 524. Applied Regression Analysis. 4 units

Term Typically Offered: F, W, SP

Prerequisite: STAT 513 or STAT 542.

Linear regression including indicator variables, influence diagnostics, assumption analysis, selection of 'best subset', nonstandard regression models, logistic regression, nonlinear regression models. Not open to students with credit in STAT 324 or STAT 334. 4 lectures.

STAT 530. Statistical Computing with SAS. 4 units

Term Typically Offered: F, W

Prerequisite: STAT 511 or STAT 512 or STAT 513 or STAT 542.

Techniques available to the statistician for efficient use of computers to perform statistical computations and to analyze large amounts of data. Use of the SAS software system. Includes data preparation, report writing, basic statistical methods, and a research project. Not open to students with credit in STAT 330. 4 lectures.

STAT 531. Statistical Computing with R. 4 units

Term Typically Offered: W, SP

Prerequisite: Graduate standing, STAT 513 or STAT 542, and one computer programming course; or consent of instructor.

Obtain, manage, and clean data; use of regular expressions; functional and object-oriented programming; graphical, descriptive, and inferential statistical methods; random number generation; Monte Carlo methods including resampling, randomization, and simulation. Not open to students with credit in STAT 331. 4 lectures.

STAT 542. Statistical Methods for Engineers. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: MATH 142 and graduate standing.

Descriptive and graphical methods. Discrete and continuous probability distributions. One and two sample confidence intervals and hypothesis testing. Single factor analysis of variance. Quality control. Introduction to regression and to experimental design. Substantial use of statistical software. Not open to students with credit in STAT 312. 4 lectures.

STAT 570. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1-4 lectures.

Systems Integration Engineering (SIE)

SIE Courses

SIE 509. Systems Integration Overview. 1 unit

Term Typically Offered: F

Prerequisite: Admission to the graduate certificate program in Systems Integration Engineering.

Orientation and overview of the Systems Integration Engineering graduate certificate program, including introduction to systems integration, learning technologies, teamwork, personality types, leadership, desired attributes of an engineer, and presentations by visiting system experts. 1 lecture.

SIE 510. Introduction to Systems. 4 units

Term Typically Offered: F

Prerequisite: SIE 509.

Introduction to man-made and socio-technical systems, including life cycle concepts, needs analysis, requirements discovery, models, complexity, project management, life cycle costing, risk management, and decision making. Verification, validation, and virtual collaboration of teams. Course offered online only. 4 lectures.

SIE 511. Systems Analysis. 4 units

Term Typically Offered: W

Prerequisite: SIE 510.

Analysis topics and techniques within the systems context, including functional analysis, systems simulation, design analysis, financial analysis, schedule analysis, manufacturability, reliability, maintainability, and usability. Course offered online only. 4 lectures.

SIE 512. Systems Synthesis. 4 units

Term Typically Offered: SP

Prerequisite: SIE 511.

Systems synthesis and integration through systems thinking, interface management, configuration management, lean systems, A3 Thinking, commercial versus government systems, system verification and validation, and internal versus external subsystem development. Course offered online only. 4 lectures.

Theatre (TH)

TH Courses

TH 101. First-Year Theatre Seminar. 1 unit

CR/NC

Term Typically Offered: F

Prerequisite: Theatre Arts major.

Introduction to the study of Theatre, focusing on methods, topics and skills in the Theatre Arts major at Cal Poly. Emphasis on practical and professional expectations as well as opportunities within the Department. Examination of curricula, areas of interest, and career planning. Credit/No Credit Grading only. 1 seminar.

TH 210. Introduction to Theatre. 4 units

GE Area C3

Term Typically Offered: F, W, SP

Overview of theatre principles and production practices, including terminology and conventions, methods, dramatic literature and performance, aesthetic appreciation, and technology. Emphasis on theatre as an integral cultural, social, and artistic entity. Attendance at theatre performance(s) required. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE C3.

TH 220. Acting Methods. 4 units

Term Typically Offered: W, SP

Prerequisite: TH 210.

Contemporary acting techniques focused on character building, objectives and tactics, with a focus on the development and implementation of various interactive methods of vocal work, images and actor resources. 3 lectures, 1 activity.

TH 225. Costume Construction I. 4 units

Term Typically Offered: F, W, SP

Basic costume construction techniques used in the entertainment industry. Building of all costumes and special craft projects for main stage theatre productions. May not be taken concurrently with TH 230 or TH 330. 4 laboratories.

TH 227. Theatre History I. 4 units

GE Area C3

Term Typically Offered: F

Highlights of European theatrical history - Greeks, Romans, Medieval English and French theatre through the 17th century. Production methods, acting styles, playwriting theories and representative plays. 4 lectures. Fulfills GE C3.

TH 228. Theatre History II. 4 units

GE Area C3

Term Typically Offered: F, W

Highlights of European and American theatrical history from the 18th to 20th century. Production methods, acting styles, playwriting theories and representative plays. 4 lectures. Fulfills GE C3.

TH 230. Stagecraft I. 4 units

Term Typically Offered: F, W, SP

Basic stagecraft technique used in the entertainment industry. Construction and painting of scenery, building and gathering properties, hanging and focusing lighting instruments, and acting as running crew for department production each term. May not be taken concurrently with TH 225 or TH 325. 4 laboratories.

TH 240. Improvisational Theatre. 4 units

Term Typically Offered: W, SP

Objectives and techniques of improvisational theatre. Participation in a series of exercises designed to develop skills in dramatic structure formatting, interactive problem solving, spontaneous scripting, dynamic communications, and applied performance styles. 2 lectures, 2 activities.

TH 245. Introduction to Stage Management. 4 units

Term Typically Offered: W

Prerequisite: TH 210.

Basic stage managerial skills for organizing, preparing, and fulfilling theatrical productions from the inception through rehearsal and performance. 4 lectures.

TH 260. Voice and Diction for the Stage. 4 units

Term Typically Offered: W

Theory and practice in developing command of oral techniques for the stage including breath support, resonance and articulation. 4 lectures.

TH 270. Stage Make-Up. 4 units

Term Typically Offered: F

Introduction to the art of theatrical make-up design and application. Techniques for producing character, old age, fantasy and special effects make-up. Demonstration and discussion of various design and application styles. 3 lectures, 1 activity.

TH 275. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

TH 280. Body Awareness and Expression. 4 units

Term Typically Offered: TBD

Directed group study of movement techniques and exercises to facilitate expressive physical performance. Body effectiveness, alignment and conditioning practice integrated with creative exploration and movement analysis of effort, spatial awareness and detailed body usage. 4 lectures. Crosslisted as DANC/TH 280.

TH 285. Internship. 1-4 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: TH 101; TH 210; and consent of instructor.

Part-time, supervised internship experience for Freshmen & Sophomore students in theatre or equivalent professionally related industry. Ability to work independently; strong verbal and written skills. Faculty approval of internship position required. Evaluations by supervisor and written reports by student required. 30 - 120 hours of work experience. Total credit limited to 4 units. Credit/ No credit grading only.

TH 290. Script Analysis. 4 units

Term Typically Offered: SP

Prerequisite: TH 210, TH 227 or TH 228.

Script analysis taught as an essential applied skill for actors, designers and directors. Students read a variety of plays and learn how to examine their structure, theme and context. 4 seminars.

TH 295. Foundations in Theatrical Design. 4 units

Term Typically Offered: SP

Prerequisite: TH 210.

Exploration of the fundamental principles and practices of designing for the stage. Emphasis placed upon the creative and collaborative process of theatre; development of the visual world of the play via language, color, drawing, analysis, and peer evaluation. 3 lectures, 1 activity.

TH 305. Topics in Diversity on the American Stage. 4 units

GE Area C4; USCP

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C3 (TH 210 recommended); or TH 210, TH 227, or TH 228 for Theatre majors.

Critical analysis of traditionally underrepresented groups in the American theatre, as writers, practitioners, story subjects. Investigation of dramatic literature and performance trends related to special interest topics. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Fulfills GE C4 except for Theatre majors. Fulfills USCP.

TH 325. Costume Construction II. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing.

Specialized and advanced costume construction techniques used in the entertainment industry. Building of all costumes and special craft projects for main stage theatre productions. Total credit limited to 8 units. May not be taken concurrently with TH 230 or TH 330. 4 laboratories.

TH 330. Stagecraft II. 4 units

Term Typically Offered: F, W, SP

Prerequisite: Junior standing.

Basic stagecraft technique used in the entertainment industry. Students construct and paint scenery, build and gather properties, hang and focus lighting instruments, and act as running crew for department production each term. Total credit limited to 8 units. May not be taken concurrently with TH 225 or TH 325. 4 laboratories.

TH 341. Advanced Acting Studio. 4 units

Term Typically Offered: F

Prerequisite: TH 210 and TH 220.

Selected acting techniques with focus on specific advanced modes of training. The Schedule of Classes will list topic selected. Total credit limited to 12 units. 3 lectures, 1 activity.

TH 345. Rehearsal and Performance. 4 units

Term Typically Offered: F, W, SP

Prerequisite: By audition only.

Preparation of a play for public presentation, including acting, stage management, publicity, or serving as a key member of the artistic team. Total credit limited to 12 units. Major credit limited to 4 units; repeated units are free electives. 4 laboratories.

TH 350. Seminar in Playwriting. 4 units

Term Typically Offered: W

Prerequisite: TH 210; and completion of GE Area A with a grade of C- or better.

Examines dramatic structure, techniques of dialogue, and means of characterization in variety of plays. Relates dramatic writing to technical, design, directorial and acting demands. Compositions of monologues, scenes and one-act play; works read and critiqued in class. 4 seminars.

TH 360. Theatre in the United States. 4 units

GE Area C4

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C3 (TH 210 recommended); or TH 210, TH 227, or TH 228 for Theatre majors.

Examination of specific American plays, playwrights, organizations and movements, applying them as portraits of the United States' historical, philosophical and cultural make-up. Topical emphasis focuses on the definition and development of an 'American' identity via the context of theatre. 4 lectures. Fulfills GE C4 except for Theatre majors.

TH 370. Costume History. 4 units

Term Typically Offered: TBD

Prerequisite: TH 210.

Dress worn in Western society from Ancient Egypt through AD 2000. Silhouette; how, when, and why particular garments were worn; emphasis on social, political, and economic context. 4 lectures.

TH 380. Theatre for Young Audiences. 4 units

Term Typically Offered: TBD

Prerequisite: TH 210 or upper-division Liberal Studies, Child Development or Psychology course.

Practice of educational drama as applied to multidisciplinary curricula. Collaborate on story-based improvisation in areas that include language arts, social studies, geography and science with additional focus on examining emotional development and creativity. 3 lectures, 1 activity.

TH 390. Global Theatre and Performance. 4 units

GE Area C4

Term Typically Offered: SU

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C3 (TH 210 recommended); or TH 210, TH 227, or TH 228 for Theatre majors.

Investigation of non-American theatre and dramatic performance; emphasis on plays, playwrights, and movements as portraits of philosophical/national make-up. Topical emphasis focuses on the definition and development of a cultural identity via the context of historical and contemporary theatre practices. 4 lectures. Fulfills GE C4 except for Theatre majors.

TH 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department head.

Individual investigation, research, or project centering around theatre. Total credit limited to 8 units.

TH 430. Scenic Design. 4 units

Term Typically Offered: F

Prerequisite: TH 290 and TH 295.

Scenic design process used in the entertainment industry, including collaboration, concept development, research, sketching, drafting, color rendering using a variety of media, 3D model building, and the presentation of design material. 3 lectures, 1 activity.

TH 432. Costume Design. 4 units

Term Typically Offered: W

Prerequisite: TH 290 and TH 295.

Costume design process used in the entertainment industry, including collaboration, concept development, research, sketching, color rendering using a variety of media, and the presentation of design material. 3 lectures, 1 activity.

TH 434. Lighting Design. 4 units

Term Typically Offered: SP

Prerequisite: TH 290 and TH 295.

Lighting design process used in the entertainment industry, including collaboration, concept development, research, functional aspects of lighting equipment, CAD drafting, the development of production paperwork and presentation of design material. 3 lectures, 1 activity.

TH 450. Directing. 4 units

Term Typically Offered: SP

Prerequisite: TH 290 and consent of instructor.

Principles, philosophies, analytical methods, business practices, organizational techniques and interpersonal strategies of directing for the stage. Experiential work includes hands-on, in-class exercises, as well as intensive outside class rehearsals. Culmination in a public production of student-directed one-act plays. 3 lectures, 1 activity.

TH 461. Senior Project Seminar. 3 units

Term Typically Offered: F

Prerequisite: Senior standing and Theatre majors only.

Focus on post-graduate career planning options in theatre arts, including resume and portfolio building, preparation for professional work, graduate school and internships. A structure by which students design and submit their senior projects. 3 seminars.

TH 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

TH 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for theatre students. Class Schedule will list topics selected. Total credit limited to 12 units. 1-4 laboratories.

TH 480. Advanced Internship. 4 units

CR/NC

Term Typically Offered: F, W, SP

Prerequisite: Junior standing with a minimum 3.0 GPA and consent of instructor.

Part-time, supervised internship experience in the entertainment or equivalent professional industry. Ability to work independently; strong verbal and written skills. Faculty approval required. Evaluations by internship supervisor and written reports by student required. 120 hours of work experience. Total credit limited to 8 units. Credit/No Credit grading.

University Studies (UNIV)

UNIV Courses

UNIV 100. University Studies. 1 unit

CR/NC

Term Typically Offered: F, SU

Course supports the successful student transition to Cal Poly. Establishes links between student needs and campus resources. Covers goal setting, degree planning, campus and academic policies, time management, college and campus culture, growth mindset and effective learning strategies. Not open to students with credit in EDUC/UNIV 125. Credit/No Credit grading only. 1 lecture.

UNIV 125. First Year Seminar. 2 units

CR/NC

Term Typically Offered: F

Issues associated with the successful transition from high school or community college to Cal Poly. Links fostered between student needs and campus resources. Coverage of academic policies and procedures, university study skills, goal setting, career planning, wellness and other topics relevant to student success. Not open to students with credit in UNIV 100. Credit/No Credit grading only. 1 lecture, 1 activity. Crosslisted as EDUC/UNIV 125.

UNIV 321. Undergraduate Research Methods and Practice. 4 units

Term Typically Offered: TBD

Prerequisite: Completion of GE Area A with a grade of C- or better; GE Area B1; and consent of instructor.

Research methods and tools for sciences and humanities, including formulating a research question, designing a study, using the scientific method to conduct and analyze surveys, and analyzing data. Emphasis on working in interdisciplinary research teams. Total credit limited to 8 units. 2 lectures, 2 activities. Crosslisted as HNRS/UNIV 321.

UNIV 330. Cal Poly Land: Nature, Technology, and Society. 4 units

GE Area F

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area B.

Scientific investigation of the natural features of the Cal Poly landscape and their transformations by land management technology. Analysis of the environmental, economic, social, and political effects of agriculture, resource extraction, and construction technology on that landscape. Emphasis on the educational, land-use, and long term planning issues of technology presented by this case study. 4 lectures. Crosslisted as AG/ISLA/UNIV 330. Fulfills GE Area F.

UNIV 333. World Food Systems. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing and completion of GE Area B.

Integrated, interdisciplinary study of the technologies of global food production, environmental and social issues related to the application of those technologies, and moral and ethical issues associated with global food production and distribution. Emphasis on the politics of change. 4 lectures. Crosslisted as POLS/UNIV 333. Fulfills GE Area F.

UNIV 350. The Global Environment. 4 units

GE Area F

Term Typically Offered: TBD

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and completion of GE Area B.

Interdisciplinary investigation of how human activities impact the Earth's environment on a global scale. Examination of population, resource use, climate change, and biodiversity from scientific/technical and social/economic/historical/political perspectives. Use of remote sensing maps. Sustainable solutions. 4 lectures. Crosslisted as AG/EDES/ENGR/GEOG/ISLA/SCM/UNIV 350. Fulfills GE Area F.

UNIV 391. Appropriate Technology for the World's People: Development. 4 units

GE Area D5

Term Typically Offered: F

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and two courses from GE D1-D4.

A broad overview of international development and appropriate design for sustainability. Besides traditional classroom work, students work in teams to address problems with technical solutions. Collaboration with mentors from the university, private sector, and nonprofits serves to provide diverse background and project mentorship. 4 lectures. Crosslisted as HNRS/PSC/UNIV 391. Fulfills GE D5.

UNIV 392. Appropriate Technology for the World's People: Design. 4 units

GE Area F

Term Typically Offered: SP

Prerequisite: Junior standing and completion of GE Area B, or graduate standing. Recommended: UNIV 391, GE Area D2, and GE Area D3.

Addresses the needs of international impoverished communities with technological solutions, which are inexpensive, ecologically sustainable, and socially appropriate. Group study of target communities, and design and construction of an appropriate technology prototype. Not open to students with credit in PSC/UNIV/HNRS 492. 3 lectures, 1 laboratory. Crosslisted as HNRS/PSC/UNIV 392. Fulfills GE Area F.

UNIV 424. Design of Museum Displays of Science, Engineering and Technology. 4 units

Term Typically Offered: TBD

Prerequisite: GE Area B.

The design and creation of educational museum displays that highlight science, engineering, and technology. Projects done by multidisciplinary teams and for clients in the community. Emphasis on design, teamwork, service learning and project management. 3 lectures, 1 laboratory. Crosslisted as HNRS/UNIV 424.

UNIV 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

UNIV 491. Appropriate Technology for the World's People: Development. 4 units

Term Typically Offered: F

Prerequisite: Consent of instructor, and senior or graduate standing.

Corequisite: GE Area D5.

A broad overview of international development and appropriate design for sustainability. Besides traditional classroom work, students work in teams to address problems with technical solutions. Collaboration with mentors from the university, private sector, and nonprofits serves to provide diverse background and mentorship. Seminar paper required. Not open to students with credit in PSC/UNIV/HNRS 391. 4 lectures. Crosslisted as PSC/UNIV 491.

UNIV 492. Appropriate Technology for the World's People: Design. 4 units

Term Typically Offered: SP

Prerequisite: Junior standing and completion of GE Area B, or graduate standing. Recommended: UNIV 391, GE Area D2, and GE Area D3.

Addresses the needs of international impoverished communities with technological solutions, which are inexpensive, ecologically sustainable, and socially appropriate. Group study of target communities, and design and construction of an appropriate technology prototype. Seminar paper required. Not open to students with credit in PSC/UNIV/HNRS 392. 3 lectures, 1 laboratory. Crosslisted as PSC/UNIV 492.

Wine and Viticulture (WVIT)

WVIT Courses

WVIT 101. Orientation to Wine and Viticulture. 1 unit

CR/NC

Term Typically Offered: F

Introduction to the wine and viticulture program. Emphasis on curriculum and career planning. Credit/No Credit grading only. 1 lecture.

WVIT 102. Global Wine and Viticulture. 4 units

Term Typically Offered: F, SP

Introduction to wine grape growing, winemaking, and wine business. Brief history and overview of major global wine regions, including growing conditions, grape varieties, winemaking styles, and wine business practices. 4 lectures.

WVIT 202. Fundamentals of Enology. 4 units

Term Typically Offered: F, SP

Prerequisite: CHEM 111 or CHEM 127.

Introduction to the science of winemaking: development of wine components in grapes, grape maturation, harvesting, pre-fermentation wine-making methods, alcoholic fermentation, malolactic fermentation, wine maturation and post fermentation practices, wine spoilage, maintenance of wine integrity. 4 lectures.

WVIT 210. Viticultural Practices. 2 units

Term Typically Offered: F, SP

Critical viticultural practices including planting, pruning, canopy management, fruit thinning, harvest, floor management, trellis and irrigation maintenance. 2 activities. Crosslisted as AEPS/WVIT 210.

WVIT 233. Basic Viticulture. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: AEPS 120 or BOT 121; CHEM 111 or CHEM 127; and SS 121.

Fundamentals of grape growing, with emphasis on wine grapes. Fundamentals of vine anatomy and physiology, development and phenology, trellising systems, soils, climatic factors, vineyard establishment, grafting, irrigation, fertility, harvest practices, pruning, major pests, and major varieties and rootstocks. Not open to students with credit in WVIT 231. 4 lectures. Formerly WVIT 232.

WVIT 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

WVIT 301. Wine Microbiology. 4 units

Term Typically Offered: SP

Prerequisite: MCRO majors must have MCRO 224; WVIT majors must have MCRO 221 or MCRO 224; and WVIT 202; open to MCRO or WVIT majors only.

Wine yeasts, bacteria, and molds: morphology and methods of identification; successful alcoholic and malolactic fermentations; management and prevention of unwanted microbial growth; micro-organisms and flavor development. 3 lectures, 1 laboratory. Crosslisted as MCRO/WVIT 301.

WVIT 302. Wine Fermentation Laboratory. 2 units

Term Typically Offered: W, SP, SU

Prerequisite: WVIT 202; WVIT major; and at least 18 years in age.

Alcoholic and malolactic fermentation, maturation, stabilization and bottling of finished wines. Not open to students with credit in WVIT 404, WVIT 405 or WVIT 406. 1 lecture, 1 laboratory.

WVIT 331. Advanced Viticulture - Fall. 4 units

Term Typically Offered: F, SU

Prerequisite: AEPS/WVIT 231 or WVIT 232 or WVIT 233.

Advanced viticulture theory and practice, with an emphasis on fall season activities. Identification of rootstocks, wine and table grapes, species taxonomy and diversity, and breeding for grapevine improvement. Field trips required. 3 lectures, 1 laboratory. Crosslisted as AEPS/WVIT 331.

WVIT 332. Advanced Viticulture - Winter. 4 units

Term Typically Offered: W

Prerequisite: AEPS/WVIT 231 or WVIT 232 or WVIT 233.

Advanced viticulture theory and practice with emphasis on winter season activities. Pruning to influence vine balance, productivity, training and trellising systems, vineyard establishment, cover cropping and weed management. Field trips required. 3 lectures, 1 laboratory.

WVIT 333. Advanced Viticulture - Spring. 4 units

Term Typically Offered: SP

Prerequisite: AEPS/WVIT 231 or WVIT 232 or WVIT 233.

Advanced viticulture theory and practices with emphasis on spring activities. Vine source/sink relations, factors impacting yield and berry composition, the role environmental conditions on vine physiology, and canopy management. Field trips required. 3 lectures, 1 laboratory.

WVIT 339. Internship Wine and Viticulture. 1-12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: WVIT 202; AEPS/WVIT 231 or WVIT 232 or WVIT 233; junior standing; and consent of internship instructor.

One or two quarters spent with an approved wine industry employer engaged in wine production or related agribusiness and viticulture activities. Applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Total Major credit limited to 6 units. Total credit limited to 12 units. Credit/No Credit grading only.

WVIT 343. Branded Wine Marketing. 4 units

Term Typically Offered: F, W, SP

Prerequisite: AGB 212 or ECON 201 or ECON 221 or ECON 222.

Wine pricing as it relates to quality, packaging, and service. Distribution options with emphasis on the three tier system, promotional strategies, including public relations, mass media advertising, personal selling, and direct marketing. Domestic and international marketplaces. 4 lectures.

WVIT 344. Direct to Consumer Wine Sales. 4 units

Term Typically Offered: SP

Prerequisite: WVIT or RPTA major. Co-requisite: AGB 212 or ECON 201 or ECON 221 or ECON 222.

Factors driving direct-to-consumer initiatives in the US wine business: tasting rooms, wine clubs/mailling lists, eCommerce, telemarketing, and events. Using current research and case studies to explore features of a direct-to-consumer approach, while facilitating compliance. Topics include: experiential marketing, social media, brand differentiation. 4 lectures.

WVIT 365. Wine Analysis and Amelioration. 4 units

Term Typically Offered: W, SP

Prerequisite: WVIT 202; CHEM 312; and CHEM 313; for WVIT majors only.

Winery laboratory practices. Basic principles, techniques, and interpretation of common analyses for sugars, acidity, nitrogen, alcohol, volatile acidity, sulfur dioxide, phenols and color; wine and must amelioration, amendment effects, usage, calculations and procedures of addition. 3 lectures, 1 laboratory.

WVIT 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 4 units per quarter.

WVIT 404. Winemaking I. 4 units

Term Typically Offered: F

Prerequisite: WVIT 202; WVIT 365; WVIT major; and at least 18 years in age.

Planning, managing and implementing harvest in the pilot winery; sanitation practices; monitoring grape maturity; handling juices and musts; alcoholic and malolactic fermentation, general cellar practices; sensory and laboratory analyses. 3 lectures, 1 laboratory.

WVIT 405. Winemaking II. 4 units

Term Typically Offered: W

Prerequisite: WVIT 404; WVIT major; and at least 18 years in age.

Planning, managing and implementing harvest in the pilot winery; sanitation practices; monitoring and maintaining wine integrity; planning for bottling; blending trials; general cellar practices; sensory and laboratory analyses. 3 lectures, 1 laboratory.

WVIT 406. Winemaking III. 4 units

Term Typically Offered: SP

Prerequisite: WVIT 405; WVIT major; and at least 18 years in age.

Planning, managing and implementing the preparation of wine for bottling; blending; fining; filtration; bottling; conducting general cellar practices; sensory and laboratory analyses. 3 lectures, 1 laboratory.

WVIT 414. Grape Pest Management. 4 units

Term Typically Offered: F, SP

Prerequisite: AEPS/WVIT 231, WVIT 232 or WVIT 233; AEPS 313; AEPS/BOT 323.

Comprehensive survey of major grape pests including diseases, insects, weeds, vertebrates, and nematodes. Identification and biology of grape pests and natural enemies, monitoring, and integrated pest management (IPM) strategies, including cultural, biological, and chemical controls. Guest lectures. 3 lectures, 1 activity. Crosslisted as AEPS/WVIT 414.

WVIT 423. Wine Law and Compliance. 4 units

Term Typically Offered: W, SP

Prerequisite: WVIT 343.

Legal aspects of wine making/marketing. Emphasis of both Federal (Tax and Trade Bureau) and State business requirements as well as State and Federal regulations impacting winery and viticultural practices in California. 4 lectures.

WVIT 428. Winegrape Vineyard Management. 4 units

Term Typically Offered: SP

Prerequisite: AGB 214, SS 221 and WVIT 233. Recommended: WVIT 331, WVIT 332, and WVIT 333.

Winegrape vineyard management practices including: financial projections and budgeting, contracting and supervision of labor, trellis installation and repair, irrigation systems maintenance, fertilization and spray scheduling. Field trips required. 3 lectures, 1 laboratory.

WVIT 433. Wine Sales and E-Commerce. 4 units

Term Typically Offered: W

Prerequisite: WVIT 343.

Professional selling in the wine industry. Selling wine through the seven avenues of wine distribution in the 3-tier system. Exploration of aspects of wine selling, from customer relation management to cultural and legal differences among states. How strategies for selling differ for various sized wineries. 4 lectures.

WVIT 442. Sensory Evaluation of Wine. 4 units

Term Typically Offered: F,W,SP,SU

Prerequisite: WVIT 202; STAT 218; WVIT major; and at least 18 years in age.

Evaluation of wines using the techniques in sensory evaluation. Difference and rating tests; descriptive analysis and pairing of wine and food. 3 lectures, 1 laboratory.

WVIT 444. Wine Marketing Research and Market Analysis. 4 units

Term Typically Offered: F

Prerequisite: STAT 217 or STAT 218; and WVIT 343.

Application of statistical theory to design research to examine the wine and grape markets. Research examining the evaluation of appropriate data collection methods, quantitative analyses, and interpretation of primary and secondary wine and grape industry data. 4 lectures.

WVIT 447. Logistics for the Global Wine Industry. 4 units

Term Typically Offered: W

Prerequisite: WVIT 102; WVIT 343; and STAT 218.

Scope and elements of the international wine logistics system including supply and distribution channels, transportation, inventory, warehousing, packaging and order processing. 4 lectures.

WVIT 450. Wine Business Strategies. 4 units

Term Typically Offered: W

Prerequisite: AGB 214 and WVIT 343.

The strategic planning process for wine businesses. Development of a complete business plan with careful adherence to the unique and complex regulations that apply to wine businesses. The business plan will include specification of the product, distribution, finance, and marketing. 4 lectures.

WVIT 460. Senior Project - Wine Business. 4 units

Term Typically Offered: F, W

Prerequisite: WVIT 343; and one of the following: WVIT 444 or WVIT 450; Senior standing; and WVIT major.

Selection and analysis of wine and viticulture business problems and opportunities in directed group-based projects. Problems typical to those that graduates may encounter in marketing and management in the wine and viticulture industry. Formal report and presentation required. 4 lectures.

WVIT 463. Issues, Trends and Careers in the Wine Industry. 2 units

Term Typically Offered: W, SP

Prerequisite: Senior standing; WVIT majors only.

Current issues and trends in viticulture, enology and wine business. Career opportunities and planning for WVIT majors nearing graduation. 2 seminars.

WVIT 464. Senior Project - Enology and Viticulture. 4 units

Term Typically Offered: F, W, SP

Prerequisite: STAT 218; junior standing; completion of the Graduate Writing Requirement.

Completion of a research proposal and comprehensive literature review, including analysis of experimental results from published peer-reviewed articles in enology and/or viticulture. Written and oral presentations. 4 lectures.

WVIT 465. Senior Project - Research Experience in Enology or Viticulture. 2 units

Term Typically Offered: TBD

Prerequisite: STAT 218; completion of the Graduate Writing Requirement; and consent of instructor.

Involvement in the experimental design, execution, data analysis and reporting of research under the direct supervision of faculty. Completion of several critiques of current peer-reviewed journal articles in enology and/or viticulture. Total credit limited to 4 units.

WVIT 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

WVIT 471. Selected Advanced Laboratory. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 laboratories.

Women's and Gender Studies (WGS)

WGS Courses

WGS 201. Introduction to Women's and Gender Studies in the United States. 4 units

GE Area D1; USCP

Term Typically Offered: F, W, SP

Introduction to theories and research on how genders and sexualities in the US shape and are shaped by historical processes and US institutional formation - specifically social, political, economic, legal, cultural institutions. Emphasis on interlocking systems of gender, sexuality, race and class. 4 lectures. Crosslisted as HNRS 204/WGS 201. Fulfills GE Area D1 and USCP.

WGS 270. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Open to undergraduate students and consent of instructor.

Directed group study of selected topics. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

WGS 301. Contemporary Issues in Women's and Gender Studies. 4 units

GE Area D5; USCP

Term Typically Offered: F, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and two courses from lower division Area D. Recommended: WGS 201.

Exploration of contemporary issues in local, national, and comparative transnational contexts as addressed within the interdisciplinary field of Women's & Gender Studies, with an emphasis on the complex intersections of gender and sexuality with race, class, and other social factors. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Fulfills GE D5 and USCP.

WGS 302. Contemporary Issues in Queer Studies. 4 units

GE Area D5; USCP

Term Typically Offered: F, W

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course from lower division Area D.

Exploration of contemporary issues as addressed within the interdisciplinary field of Queer Studies, with an emphasis on the relationships between constructions, experiences and expressions of sexuality and interlocking systems of race, ethnicity, religion, class, nation, age, dis/ability and gender in local, national, and transnational contexts. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 4 lectures. Fulfills GE D5 and USCP.

WGS 311. Sociology of Gender. 4 units

Term Typically Offered: W, SP

Prerequisite: Junior standing.

Analysis of social constructions of sex and gender. Explores how gender stereotypes are created and reproduced. Focus on media representations; intersections of gender, race, class, sexuality; and effects on individuals and structures of work, education, family, and abusive relationships. 4 lectures. Crosslisted as SOC/WGS 311.

WGS 316. Women as Subject and Object in Art History. 4 units

Term Typically Offered: W

Prerequisite: one of the following: ART 111, ART 112, ART 211, ART 212, ART 213, or WGS 201.

Exploration of the role of women in the visual arts. Women as artists, women as portrayed in art, and feminist theory as it applies to the study of the visual arts and art history. 4 lectures. Crosslisted as ART/WGS 316.

WGS 320. Women, Gender and Sexuality in Global Perspective. 4 units

GE Area D5

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course from lower division Area D.

Examination of women's lives, genders and sexualities in relation to intersecting systems of class, race/ethnicity, religion and nation in comparative cross-cultural contexts. Includes study of global and transnational feminisms, reproductive rights, women's labor, women in development, women's politics. 4 lectures. Fulfills GE D5.

WGS 324. Psychology of Gender. 4 units

Term Typically Offered: SU

Prerequisite: PSY 201 or PSY 202.

Investigation of psychological genders and sexualities beyond ideas associated with biological sex. Exploration of sex/gender/sexuality differences from a social psychological (e.g., socialization) perspective. Implications of gender roles (including masculinity, femininity, non-binary) and sexual identities for relationships and health. 4 lectures. Crosslisted as PSY/WGS 324.

WGS 336. Feminist Ethics, Gender, Sexuality and Society. 4 units

GE Area C4; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing or Philosophy major; completion of GE Area A with a grade of C- or better; and GE Area C2.

Critical examination of the relations between gender, sexuality, ethnicity, society and ethics from feminist perspectives, with special attention paid to problems in contemporary applied ethics. Joint focus on theory and application. 4 lectures. Crosslisted as PHIL/WGS 336. Fulfills GE C4 except for Philosophy majors. Fulfills USCP.

WGS 340. Sexuality Studies. 4 units

GE Area D5

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course from lower division Area D.

Sexuality in a cultural and historical context. Changing definitions of human subjectivity. The cultural and social regimes that control and create sexuality (including the 'invention' of homo/heterosexuality and the social, legal and political systems that define sexual ab/normality). Contemporary issues of sexual orientation and topics of sexuality in relation to gender and race. 4 seminars. Crosslisted as WGS/HNRS 340. Fulfills GE D5.

WGS 345. Queer Ethnic Studies. 4 units

GE Area D5; USCP

Term Typically Offered: F, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course from lower division Area D.

Theories, research and methods focused on the interlocking systems of sexuality, race, racialization, and ethnicity in local, national and comparative global/transnational contexts. Relationships between racialization and heteronormativity; queer of color critique; queer migration; decolonizing queer organizing, theory, and knowledge production. 4 lectures. Crosslisted as ES/WGS 345. Fulfills GE D5 except for Ethnic Studies majors. Fulfills USCP.

WGS 350. Gender, Race, Culture, Science and Technology. 4 units

GE Area F; USCP

Term Typically Offered: F, W, SP

Prerequisite: Junior standing; completion of GE Area B.

Interdisciplinary examination of the complex relationships between gender, race, culture, science, technology in educational, work, knowledge production, policy, and ethical contexts. Topics may include reproductive, medical, genetic, and emerging technologies and exploration of efforts to create more socially responsible science/technology. 3 lectures, 1 activity. Crosslisted as ES 350/HNRS 353/WGS 350. Fulfills GE Area F and USCP.

WGS 351. Gender, Race, Class, Nation in Global Engineering, Technology & International Development. 4 units

GE Area D5

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one lower division course in Area D.

Cross-cultural exploration of the intersections of gender, race, class, nation in the global engineering workforce, small- and large-scale technological systems, and international development programs; special attention to 21st century challenges and efforts to create more socially responsible engineering and technology. 4 lectures. Crosslisted as ES/WGS 351. Fulfills GE Area D5 except for Comparative Ethnic Studies majors.

WGS 370. Religion, Gender, and Society. 4 units

GE Area C4; USCP

Term Typically Offered: W, SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and GE Area C2.

Critical examination of religious ideas and institutions in the United States. Focus on interlocking systems of sex, gender, race, class and religion; individual and group experiences at the intersection of religion, politics and culture. 4 lectures. Crosslisted as RELS/WGS 370. Fulfills GE C4 and USCP.

WGS 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: WGS 201 or consent of Women's and Gender Studies Chair.

Individual investigation, research studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 4 units per quarter.

WGS 401. Seminar in Women's and Gender Studies. 4 units

Term Typically Offered: SP

Prerequisite: WGS 201. Recommended: Junior standing.

Intensive study of a selected topic in Women's and Gender Studies (such as gender and work, gender and the law, sexuality and the arts). The Schedule of Classes will list topic selected. Field experience may be required as appropriate. May be repeated for up to 8 units. 3 seminars and a supervised research project.

WGS 417. Feminist Legal Theory. 4 units

Term Typically Offered: SP

Prerequisite: Completion of GE D1. Recommended: POLS 112.

Different approaches to US feminist legal theory and topics in gender and US law. Topics covered include employment, domestic violence, sexual harassment, reproductive justice, sex work, rape, and welfare reform. 4 seminars. Crosslisted as POLS/WGS 417.

WGS 421. The History of Prostitution. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303; completion of GE Area D5; or graduate standing.

Comparative history of prostitution from antiquity to present. Analysis of prostitution from social, cultural, political, gendered and economic perspectives. 4 lectures. Crosslisted as HIST/WGS 421.

WGS 434. American Women's History to 1870. 4 units

Term Typically Offered: F

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.

Female ideology and experience from the colonial period through the American Civil War. Use of a variety of sources, including women's own writing, in order to understand the history of women as it both reflects and shapes American culture and society. 3 lectures and research project. Crosslisted as HIST/WGS 434.

WGS 435. American Women's History from 1870. 4 units

USCP

Term Typically Offered: W

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.

The female past in the modern period of U.S. history. Considers how transformations in gender roles are reflective of other significant changes in American culture and society. Emphasis on class, race, and ethnic variations in women's experience. 3 lectures and research project. Crosslisted as HIST/WGS 435. Fulfills USCP.

WGS 450. Feminist Theory. 4 units

USCP

Term Typically Offered: W

Prerequisite: WGS 201.

Advanced critical examination of the history and evolution of ideas in feminist theory. Focus on genders and sexualities in relation to race/ethnicity, religion, class, nation, age, dis/ability, with special attention to relationships between theory and praxis/application. 3 lectures, 1 activity. Fulfills USCP.

WGS 457. U.S. Reproductive Politics. 4 units

Term Typically Offered: SP

Prerequisite: Completion of GE D1. Recommended: POLS 112.

Multi-disciplinary approach to the study of the law and politics of reproduction in the United States. Topics studied include histories of reproductive regulation, abortion law and politics, technology and fertility, and social policy and reproductive control. 4 seminars. Crosslisted as POLS/WGS 457.

WGS 458. Gender and Sexuality in Modern Europe. 4 units

Term Typically Offered: TBD

Prerequisite: HIST 303 or completion of GE Area D5, or graduate standing.

Social, economic, political, and cultural effects of changing gender systems in modern Europe, particularly but not exclusively with regard to sex and sexuality. 3 lectures and research project. Crosslisted as HIST/WGS 458.

WGS 467. Women's and Gender Studies Internship. 4 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: WGS 201 and consent of WGS Internship Director.

Corequisite: One additional course in WGS.

Supervised work experience in approved agency. Intern subject to of the duties/responsibilities of employees engaged in comparable work. Focus on genders, sexualities, independent utilization of WGS concepts. 30 hours of internship experience per unit of credit. Minimum of 4 units (120 hours). Total credit limited to 8 units. Credit/No Credit grading only.

WGS 470. Selected Advanced Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list title selected. Total credit limited to 8 units. 1 to 4 lectures.

World Languages and Cultures (WLC)

WLC Courses

WLC 101. Elementary World Language I. 4 units

Term Typically Offered: F

Organized group instruction arranged for students who wish to acquire basic skill in a language other than English indicated by subtitle.

Language taught in its intercultural context. 3 lectures, 1 activity.

Formerly MLL 101.

WLC 102. Elementary World Language II. 4 units

Term Typically Offered: W

Prerequisite: WLC 101 or consent of instructor.

Organized group instruction arranged for students who wish to acquire basic skill in a language other than English indicated by subtitle.

Language taught in its intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Formerly MLL 102.

WLC 103. Elementary World Language III. 4 units

Term Typically Offered: SP

Prerequisite: WLC 102 or consent of instructor.

Organized group instruction arranged for students who wish to acquire basic skill in a language other than English indicated by subtitle.

Language taught in its intercultural context. To be taken in numerical sequence. 3 lectures, 1 activity. Formerly MLL 103.

WLC 200. Special Problems for Undergraduates. 1 unit

Term Typically Offered: F, W, SP

Prerequisite: Consent of instructor.

Individual investigation, research, studies, or surveys of selected problems at the lower-division level. Total credit limited to 8 units. Formerly MLL 200.

WLC 201. Intermediate World Language I. 4 units

Term Typically Offered: F

Prerequisite: WLC 103.

Development of presentational, interpersonal, and interpretive intermediate-level language skills within an intercultural context in a language other than English indicated by subtitle. To be taken in numerical sequence. 3 lectures, 1 activity. Formerly MLL 201.

WLC 202. Intermediate World Language II. 4 units

Term Typically Offered: W

Prerequisite: WLC 201.

Development of presentational, interpersonal, and interpretive intermediate-level language skills within an intercultural context in a language other than English indicated by subtitle. To be taken in numerical sequence. 3 lectures, 1 activity. Formerly MLL 202.

WLC 270. Language Study Abroad. 4 units

Term Typically Offered: F, SU

Prerequisite: Consent of department chair.

Acquisition of language and cultural competencies while studying abroad. Total credit limited to 12 units, with a maximum of 12 units per quarter. 3 lectures, 1 activity. Formerly MLL 270.

WLC 290. Selected Topics. 1-4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics. Open to undergraduate students. The Schedule of Classes will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Formerly MLL 290.

WLC 310. Humanities in World Cultures. 4 units

GE Area C4

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course from Area C.

Interdisciplinary examination of the humanities in a selected culture. Special focus on the arts, literature, philosophy and language in that culture. The Class Schedule will list topic selected. Total credit limited to 12 units with different subtopic. 4 lectures. Fulfills GE C4. Formerly ISLA 310.

WLC 312. Humanities in Chicano/a Culture. 4 units

GE Area C4; USCP

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course from Area C.

Interdisciplinary examination of humanities in Chicano culture. Special focus on the arts, literature, social situations, and the monolingual and bilingual language aspects in Chicano culture. 4 lectures. Fulfills GE C4 and USCP. Formerly ISLA 312.

WLC 318. Culture of Spain: Activities. 2 units

CR/NC

Term Typically Offered: F

Prerequisite: Limited to Valladolid, Spain Fall program. Corequisite: WLC 310.

Examination and experience of Spanish culture via participant observation in Spain. An introductory exploration of the development of Spanish architecture, art, literature, music, theatre and popular culture as experienced in Valladolid, Spain. Credit/No Credit grading only. 2 activities. Formerly ISLA 318.

WLC 360. Research Methods in World Languages and Cultures. 4 units

Term Typically Offered: W

Prerequisite: Junior standing and MLL major. Recommended: SPAN 233 and SPAN 301.

Methods and techniques of doing research. Critical thinking and library research in languages other than English. Introduction to different senior project formats: scholarly essays, lesson planning, translations, creative works, community-based projects. 4 lectures. Formerly MLL 360.

WLC 370. Language, Technology and Society. 4 units

GE Area D5

Term Typically Offered: SP

Prerequisite: Junior standing; completion of GE Area A with a grade of C- or better; and one course in lower division Area D.

Focus on ways in which technology impacts language use. Characteristics of social media interactions (texting, Facebook) in different languages (e.g., Spanish, French, German, Chinese) are compared. Special attention given to linguistic diversity and the emergence of multilingual identities on digital platforms. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE D5, except for MLL majors.

WLC 400. Special Problems for Advanced Undergraduates. 1-4 units

Term Typically Offered: F, W, SP

Prerequisite: Consent of department chair.

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 8 units. Formerly MLL 400.

WLC 424. Methods in Teaching Languages Other Than English. 4 units

Term Typically Offered: F

Prerequisite: Admission to the Single Subject Credential Program in World Languages.

The development of objectives, curriculum, material and assessment tools for teaching world languages to a diverse student body in secondary schools. Theoretical and hands-on practice based on the California Standards for the Teaching Profession and state curriculum frameworks. 4 lectures.

WLC 425. World Languages Clinical Experience Seminar. 2 units

CR/NC

Term Typically Offered: W, SP

Prerequisite: Admission to the Single Subject Credential Program in World Languages. Corequisite: Concurrent enrollment in EDUC 469 or EDUC 479.

Principles and practices in effective teaching of world languages at the middle and high school level, learning theories, curriculum content and structure, classroom issues, and the teaching profession. Total credit limited to 4 units. Credit/No Credit grading only. 2 seminars.

WLC 451. Latin American Studies Internship. 4-12 units

CR/NC

Term Typically Offered: F,W,SP,SU

Prerequisite: Junior standing.

Supervised work experience in a private, governmental, or non-governmental organization working in Latin America or on a critical issue related to Latin America. Student engagement in all duties and responsibilities of employees and interns engaged in comparable work. 30 hours of work experience per unit of credit. Total credit limited to 12 units. Credit/No Credit grading only. Formerly ISLA 451.

WLC 460. Senior Project. 4 units

Term Typically Offered: F, W, SP

Prerequisite: WLC 360, advanced composition in primary and/or secondary language, senior standing and consent of instructor.

Selection and completion of a project under faculty mentorship. Projects represent individual, well-defined problems and potential solutions that reflect pertinent scholarly activity in the field of modern languages and literatures, with special emphasis in one of the languages/cultures taught in the department. Total credit limited to 4 units. Formerly MLL 460.

WLC 470. Selected Advanced Topics. 4 units

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Schedule of Classes will list topic selected and language of instruction. Total credit limited to 8 units. 4 lectures. Formerly MLL 470.

INDEX

A

About the Catalog	4	Architectural Engineering Minor	155
Academic Advising	418	Architecture	157
Academic Calendar 2017-2019	18	Architecture (ARCH)	540
Academic Placement	44	Art & Design	260
Academic Services and Programs	418	Art (ART)	544
Academic Standards	48	Art History Minor	263
Academic Standards and Policies	44	Asian Studies Minor	283
Academic Support and Campus Life	418	Associated Students, Inc.	428
Accounting Concentration	179	Astronautics Concentration	201
Accounting Minor	186	Astronomy and Astrophysics (ASTR)	549
Accreditation	17	Astronomy Minor	385
Actuarial Preparation Minor	338	B	
Admissions	20	BA Communication Studies	265
Advanced Food Science Concentration	111	BA Comparative Ethnic Studies	273
Advanced Phase	125	BA English	269
Aeronautics Concentration	200	BA History	281
Aerospace Engineering	198	BA Interdisciplinary Studies	286
Aerospace Engineering (AERO)	501	BA Liberal Arts and Engineering Studies	398
Agribusiness	75	BA Modern Languages and Literatures	331
Agribusiness (AGB)	509	BA Music	297
Agribusiness Minor	76	BA Philosophy	301
Agricultural and Environmental Plant Sciences (AEPS)	518	BA Physics	382
Agricultural Communication (AGC)	513	BA Political Science	305
Agricultural Communication Minor	71	BA Sociology	320
Agricultural Education (AGED)	514	BA Theatre Arts	324
Agricultural Education & Communication	77	Bachelor of Architecture	158
Agricultural Education Minor	82	Bachelor of Landscape Architecture	169
Agricultural Leadership Minor	71	Basic Phase	125
Agriculture (AG)	524	BFA Art and Design	261
American Politics Concentration	306	Bioinstrumentation Concentration	206
Anatomy and Physiology Concentration	345	Biological Sciences	340
Animal Science	84	Biology (BIO)	556
Animal Science (ASCI)	526	Biology Concentration	373
Anthropology and Geography Minor	322	Biology Minor	353
Anthropology (ANT)	532	Biomedical Engineering	203
Applied Food Technology Concentration	112	Biomedical Engineering (BMED)	563
Applied Mathematics Concentration	379	BioResource & Agricultural Engineering	95
Applied Nutrition Concentration	113	BioResource and Agricultural Engineering (BRAE)	550
Architectural Engineering	153	Biotechnology Minor	338
Architectural Engineering (ARCE)	535	Botany (BOT)	568
		BS Aerospace Engineering	199
		BS Agricultural and Environmental Plant Sciences	119
		BS Agricultural Business	75

BS Agricultural Communication	78	BS Psychology	312
BS Agricultural Science	79	BS Public Health	366
BS Agricultural Systems Management	96	BS Recreation, Parks, and Tourism Administration	101
BS Animal Science	86	BS Software Engineering	225
BS Anthropology and Geography	317	BS Statistics	395
BS Architectural Engineering	154	BS Wine and Viticulture	145
BS Biochemistry	357	Business (BUS)	569
BS Biological Sciences	342	C	
BS Biomedical Engineering	204	Cal Poly Corporation	430
BS BioResource and Agricultural Engineering	98	Cal Poly International Center	419
BS Business Administration	178	Campus Health & Wellbeing	424
BS Chemistry	359	Campus Life	428
BS Child Development	311	Career Services	425
BS City and Regional Planning	162	Chemistry & Biochemistry	356
BS Civil Engineering	211	Chemistry (CHEM)	577
BS Computer Engineering	216	Child Development (CD)	584
BS Computer Science	221	Child Development Concentration	373
BS Construction Management	167	Child Development Minor	313
BS Dairy Science	90	Chinese (CHIN)	586
BS Economics	182	City and Regional Planning	161
BS Electrical Engineering	232	City and Regional Planning (CRP)	587
BS Environmental Earth and Soil Sciences	130	City and Regional Planning Minor	165
BS Environmental Engineering	213	Civil & Environmental Engineering	209
BS Environmental Management and Protection	134	Civil Engineering (CE)	593
BS Food Science	110	College of Agriculture, Food and Environmental Sciences	63
BS Forestry and Natural Resources	138	College of Architecture and Environmental Design	150
BS General Engineering	238	College of Engineering	191
BS Graphic Communication	278	College of Liberal Arts	257
BS Industrial Engineering	241	College of Science & Mathematics	336
BS Industrial Technology and Packaging	184	Colleges and Departments	499
BS Journalism	294	Colleges and Programs	63
BS Kinesiology	364	Communication Studies	265
BS Liberal Arts and Engineering Studies	400	Communication Studies (COMS)	601
BS Liberal Studies	371	Communication Studies Minor	266
BS Manufacturing Engineering	243	Community and Public Health Concentration	368
BS Marine Sciences	349	Computer Engineering	216
BS Materials Engineering	247	Computer Engineering (CPE)	605
BS Mathematics	377	Computer Science and Software Engineering	219
BS Mechanical Engineering	252	Computer Science (CSC)	610
BS Microbiology	351	Computer Science Minor	229
BS Nutrition	112	Computing at Cal Poly	425
BS Physics	383	Computing for Interactive Arts Minor	230
		Construction Management	166

Construction Management (CM)	619	Ethics and Society Concentration	302
Construction Management Minor	168	Ethics, Public Policy, Science and Technology Minor	289
Consumer Packaging Concentration	180	Ethnic Studies	273
Courses A-Z	500	Ethnic Studies (ES)	667
Criminal Justice Concentration	321	Ethnic Studies Minor	276
Crop Science Minor	122	Evaluation of Transfer Credit	52
Cross Disciplinary Studies Minor in Data Science	397	Event Planning and Experience Management Concentration	104
Culinary Concentration	112	Event Planning and Experience Management Minor	107
Culture and Society in Health Concentration	368	Exercise Science Concentration	365
D		Experience Industry Management	101
Dairy Industries Minor	92	Extended Education	417
Dairy Science (DSCI)	623	F	
Dance (DANC)	627	Faculty and Staff	434
Dance Minor	326	Financial Information	23
Data Science (DATA)	629	Financial Management Concentration	180
Dean of Students	425	Fire Protection Engineering Applications Graduate Certificate	197
Design Reproduction Technology Concentration	279	Fire Protection Engineering (FPE)	671
Disability Resource Center	426	Fire Protection Engineering Science Graduate Certificate	197
E		Food Science & Nutrition	108
Early Start English (ESE)	629	Food Science and Nutrition (FSN)	672
Early Start Math (ESM)	629	Food Science Minor	115
Earth Science (ERSC)	629	French (FR)	678
Ecology Concentration	346	French Minor	334
Economics (ECON)	632	Fruit and Crop Science Concentration	121
Economics Minor	186	Fruit Science Minor	122
Education (EDUC)	635	G	
Electrical Engineering	231	Gender, Race, Culture, Science and Technology Minor	290
Electrical Engineering (EE)	642	General Curriculum in Biology	343
Engineering (ENGR)	650	General Curriculum in Biomedical Engineering	206
English	268	General Curriculum in General Engineering	239
English Concentration	373	General Curriculum in Mathematics	378
English (ENGL)	654	General Engineering	237
English Minor	270	General Requirements – Bachelor's Degree	30
Enology Concentration	146	Geographic Information Systems for Agriculture Minor	72
Entrepreneurship Concentration	180	Geography (GEOG)	679
Entrepreneurship Minor	186	Geology Concentration	133
Environmental Design (EDES)	664	Geology (GEOL)	681
Environmental Engineering (ENVE)	664	Geology Minor	385
Environmental Horticulture Science Concentration	120	German (GER)	682
Environmental Soil Science Minor	142	German Minor	334
Environmental Studies and Sustainability Concentration	319	Gerontology Minor and Certificate Program	313
Environmental Studies Minor	338	Global Politics Concentration	306
Equine Science Minor	93	Global Politics Minor	307

Grading	54	Italian Studies Minor	335
Graduate Education	408	J	
Graduate Studies (GS)	683	Japanese (JPNS)	725
Graduate Studies-Accounting (GSA)	684	Journalism	294
Graduate Studies-Business (GSB)	685	Journalism (JOUR)	725
Graduate Studies-Economics (GSE)	689	K	
Graduate Studies-Packaging (GSP)	695	Kinesiology and Public Health	362
Graphic Communication	277	Kinesiology (KINE)	729
Graphic Communication (GRC)	690	L	
Graphic Communication Management Concentration	279	LAES - Engineering - Computer Graphics Concentration	401
Graphic Communication Minor	280	LAES - Engineering - Electrical Engineering (Power) Concentration	401
Graphic Design Concentration	262	LAES - Engineering - Industrial/Manufacturing Engineering - System Design Concentration	401
Graphics for Packaging Concentration	280	LAES - Engineering - Usability Studies Concentration	402
H		LAES - Liberal Arts - Interactive Communication-Cinematic Focus Concentration	402
Health Promotion Concentration	366	LAES - Liberal Arts - Interactive Communication-Theatrical Focus Concentration	402
Heating, Ventilating, Air-Conditioning and Refrigerating Concentration (HVAC&R)	255	LAES - Liberal Arts - Publishing Technology Concentration	402
History	281	LAES - Liberal Arts - Technical Communication Concentration	402
History (HIST)	696	Land Rehabilitation and Restoration Ecology Minor	72
History Minor	283	Landscape Architecture	169
History/Social Sciences Concentration	374	Landscape Architecture (LA)	738
Honors Contract (HNRC)	712	Landscape Architecture Minor	171
Honors (HNRS)	704	Landscape Horticulture Minor	122
Horticulture & Crop Science	118	Latin American Studies Minor	322
Human Ecology Concentration	319	Law and Society Minor	307
Hydrology Concentration	134	Liberal Arts and Engineering Studies	398
I		Liberal Arts and Engineering Studies (LAES)	742
Inclusive Excellence	427	Liberal Studies	371
Indigenous Studies in Natural Resources and the Environment Minor ..	143	Liberal Studies (LS)	743
Industrial & Manufacturing Engineering	240	Library Services	420
Industrial and Manufacturing Engineering (IME)	717	Linguistics Minor	271
Industrial Technology and Packaging (ITP)	713	LSAMP Program	427
Industrial Technology Concentration	185	M	
Industrial Technology Minor	187	MA Biological Sciences	354
Information Systems Concentration	181	MA Curriculum and Instruction	393
Integrated Marketing Communications Minor	187	MA Education, Specialization in Counseling and Guidance	391
Interactive Entertainment Concentration	225	MA Education, Specialization in Curriculum and Instruction	392
Intercollegiate Athletics	420	MA Education, Specialization in Educational Leadership and Administration	392
Interdisciplinary Degree Programs	398	MA Education, Specialization in Special Education	392
Interdisciplinary Studies in Liberal Arts (ISLA)	723	MA Educational Leadership and Administration	393
Interdisciplinary Studies in the Liberal Arts	285	MA English	271
International Development Concentration	319	MA History	284
Italian (ITAL)	725		

Management and Human Resources Concentration	181	MS Agriculture, Specialization in Soil Science	70
Manufacturing Concentration	255	MS Architectural Engineering	156
Marine Science (MSCI)	745	MS Biological Sciences	354
Marketing Management Concentration	182	MS Biological Sciences, Specialization in Regenerative Medicine	354
Master of Agricultural Education	83	MS Biomedical Engineering	207
Master of City and Regional Planning	165	MS Biomedical Engineering, Specialization in Regenerative Medicine ..	207
Master of Public Policy	308	MS Business Analytics	189
Master of Science in Architecture	159	MS Civil and Environmental Engineering	214
Materials Engineering	247	MS Computer Science	230
Materials Engineering (MATE)	746	MS Economics	189
Mathematics	376	MS Electrical Engineering	236
Mathematics Concentration	374	MS Engineering Management	404
Mathematics (MATH)	750	MS Engineering, Specialization in Bioengineering	196
Mathematics Minor	381	MS Engineering, Specialization in Biomedical Engineering	196
Mathematics Teaching Concentration	380	MS Engineering, Specialization in Water Engineering	196
MBA - General Management Specialization	188	MS Fire Protection Engineering	196
MBA - Graphic Communication Documents Systems Management Specialization	188	MS Forestry Sciences	144
MCRP/MS Engineering, Specialization in Transportation Planning	406	MS Higher Education Counseling and Student Affairs	393
Meat Science and Processing Minor	93	MS Industrial Engineering	245
Mechanical Design Concentration	207	MS Kinesiology	369
Mechanical Engineering	251	MS Mathematics	381
Mechanical Engineering - General Concentration	254	MS Mechanical Engineering	256
Mechanical Engineering (ME)	759	MS Nutrition	116
Mechatronics Concentration	255	MS Packaging Value Chain	189
Media Arts, Society and Technology Minor	291	MS Polymers and Coatings Science	361
Microbiology (MCRO)	766	MS Psychology	314
Microbiology Minor	353	MS Quantitative Economics	189
Military Science	124	MS Special Education	394
Military Science Leadership (MSL)	767	MS Taxation	190
Military Science Minor	125	Multidisciplinary Design Minor	202
Molecular and Cellular Biology Concentration	348	Music	297
MPS Dairy Products Technology	93	Music Minor	299
MS Accounting	188	Music (MU)	769
MS Aerospace Engineering, Specialization in Research	202	N	
MS Agriculture, Specialization in Animal Science	68	Natural Resources Management and Environmental Sciences	127
MS Agriculture, Specialization in BioResource and Agricultural Systems ..	68	Natural Resources (NR)	776
MS Agriculture, Specialization in Crop Science	69	New Student & Transition Programs	430
MS Agriculture, Specialization in Dairy Products Technology	69	Nutrition and Food Industries Concentration	114
MS Agriculture, Specialization in Environmental Horticultural Science ...	69	Nutrition Minor	116
MS Agriculture, Specialization in Food Science	69	Nutrition Science Concentration	114
MS Agriculture, Specialization in Irrigation	70	O	
MS Agriculture, Specialization in Plant Protection Science	70	Orfalea College of Business	172
		Organizations Concentration	321

Other Academic Policies	57	Science and Risk Communication Minor	292
P		Science Concentration	374
Packaging Concentration	186	Social Sciences	316
Packaging Minor	187	Social Sciences (SOCS)	809
Parent and Family Programs	430	Social Services Concentration	321
Philosophy	301	Sociology Minor	322
Philosophy Minor	302	Sociology (SOC)	810
Philosophy (PHIL)	781	Soil Science (SS)	813
Photography and Video Concentration	262	Spanish Concentration	375
Photography Minor	263	Spanish Minor	335
Physical Activity in Public Health Concentration	369	Spanish (SPAN)	815
Physical Education: Men (PEM)	786	Sport & Recreation Experience Management Concentration	104
Physical Education: Women (PEW)	787	Sport Science Concentration	366
Physical Science (PSC)	787	Statistics	395
Physics	382	Statistics Minor	397
Physics Minor	385	Statistics (STAT)	818
Physics (PHYS)	788	Student Academic Services	422
Plant Protection Minor	123	Student Affairs	427
Plant Protection Science Concentration	122	Student Ombuds Services	427
Political Science	304	Student Resources	424
Political Science Minor	308	Studio Art Concentration	262
Political Science (POLS)	793	Studio Art Minor	263
Polymers and Coatings Concentration - BS Biochemistry	359	Sustainability Practices	431
Polymers and Coatings Concentration - BS Chemistry	361	Sustainable Agriculture Minor	73
Poultry Management Minor	93	Sustainable Environments Minor	152
Pre-Health Career Advising	422	Systems Integration Engineering (SIE)	822
Pre-Law Concentration	307	T	
Psychology and Child Development	309	Teaching English as a Second Language Concentration	375
Psychology Minor	313	Testing Services	423
Psychology (PSY)	799	The CSU System	472
Pure Mathematics Concentration	380	Theatre & Dance	324
Q		Theatre Minor	327
Quantitative Analysis Concentration	183	Theatre (TH)	822
Queer Studies Minor	328	Tourism, Hospitality, and Destination Management Concentration	106
R		U	
Rangeland Resources Minor	73	University Honors Program	423
Real Estate Finance Concentration	182	University Housing	432
Real Property Development Minor	151	University Learning Objectives	7
Registration	59	University Police	433
Religious Studies Minor	303	University Policies	8
Religious Studies (RELS)	806	University Studies	424
S		University Studies (UNIV)	825
School of Education	386	University Writing & Rhetoric Center	424
Science and Mathematics (SCM)	808		

Updates to the Catalog	481
------------------------------	-----

V

Viticulture Concentration	147
---------------------------------	-----

W

Water Science Minor	74
---------------------------	----

Watershed Management and Hydrology Concentration - Environmental Management and Protection	137
--	-----

Watershed Management and Hydrology Concentration - Forestry and Natural Resources	141
---	-----

Web and Digital Media Concentration	280
---	-----

Welcome to Cal Poly	3
---------------------------	---

Western Intellectual Tradition Minor	258
--	-----

Wildland Fire and Fuels Management Concentration	142
--	-----

Wildlife and Biodiversity Conservation Concentration	348
--	-----

Wildlife Biology Concentration - Environmental Management and Protection	138
--	-----

Wildlife Biology Concentration - Forestry and Natural Resources	142
---	-----

Wine and Viticulture	145
----------------------------	-----

Wine and Viticulture (WVIT)	826
-----------------------------------	-----

Wine Business Concentration	148
-----------------------------------	-----

Women's and Gender Studies	328
----------------------------------	-----

Women's and Gender Studies Minor	329
--	-----

Women's and Gender Studies (WGS)	829
--	-----

Worksite and University Health Promotion Concentration	369
--	-----

World Languages and Cultures	331
------------------------------------	-----

World Languages and Cultures (WLC)	831
--	-----