

# California Polytechnic State University, San Luis Obispo

## Construction Management Department

### CM 214 – 01/02, Residential Construction Management, Fall 2019

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<b>Office Hours:</b>	Tuesday and Thursday: 12:30 -2; Wednesday: 1 – 2
<b>Class Days/Times:</b>	Monday and Wednesday: 9 am to 1 pm Tuesday: 9 am to 12 pm Thursday: 9 am to 11 am
<b>Classroom:</b>	Bldg. 186: Room B-103
<b>Prerequisite(s):</b>	CM 115, PHYS 132 or CHEM 124. Co-requisite: 232

## Course Description

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.

Students will examine the techniques of bidding and estimating, contracts, and scheduling procedures associated with residential construction. Students will also examine the building practices of various building systems including: foundation systems, structural framing systems (lumber and concrete), exterior finish systems (roofing and cladding), MEPF systems (mechanical, electrical, plumbing and fire protection), and interior finish systems (floors, walls and ceilings.)

## Course Goals and Learning Outcomes

### Course Goals:

As a result of this course, you should be able to:

- Understand the residential construction and development sector of the construction industry and the US economy, demonstrated through the mastery of CLOs 1 through 25.
- Understand the principals, materials, and methods used in residential construction of the foundation, structural, exterior finish systems, fenestration, interior finish systems, MEPF Systems. , demonstrated through the mastery of CLOs 1 through 25.
- Create a construction project schedule for a residential project, demonstrated through the mastery of CLOs 26 through 29.

- Create a construction project cost estimate for a residence and a residential development, demonstrated through the mastery of CLOs 30 through 37.

### **Course Learning Outcomes (CLOs):**

1. Identify fundamentals of residential construction
2. Identify and apply green building guidelines
3. Recognize and identify several historical events that revolutionized homebuilding in the United States.
4. Explain the significant role that the residential construction industry plays in the overall state of the U.S. economy.
5. Explain the relationships between building standards, codes, and specifications and their role in regulating the residential building process.
6. Explain how zoning, covenants, and other regulatory controls impact the residential building process.
7. Explain the typical permitting and inspection process associated with residential construction.
8. Interpret residential plans and specifications to determine the intended methods and details of construction for a given project.
9. Identify the various types of shallow foundations typically used in residential construction and explain the impact of soil type on the foundation design.
10. Illustrate and sketch typical construction details associated with various stages of the residential building process.
11. Identify and explain the site development process (clearing, grading, excavation, site utilities, building layout, etc.) associated with residential construction and the means and methods by which these activities are accomplished.
12. Identify the various types of wood fasteners and rough hardware used in residential construction and their use in the building process.
13. Recall various window and door types utilized in residential construction and explain the standard procedures employed to install these products and/or systems.
14. Recognize and identify basic power and hand tools used in residential construction.
15. Recall various roofing types utilized in residential construction and explain the standard procedures employed to install these products and/or systems.
16. Recall various exterior finishes (wood siding, composites, vinyl, aluminum, stucco, EFIS) utilized in residential construction and explain the standard procedures employed to install these products and/or systems.
17. Recall various masonry applications (reinforced concrete masonry, brick, natural stone, cultured stone, and dry stack masonry) utilized in residential construction and explain the standard procedures employed to install these products and/or systems.
18. Identify various insulation, utility rough-in, and drywall applications utilized in residential construction and explain the standard procedures employed to install these products and/or systems.
19. Identify various finish carpentry applications including interior trim, cabinets, countertops, and miscellaneous millwork applications utilized in residential construction and explain the standard procedures employed to install these products and/or systems.
20. Recall various ceiling, wall, and floor finishes utilized in residential construction and explain the standard procedures employed to install these products and/or systems.
21. Discuss and identify the overall coordination and management issues associated with the typical residential construction process, means, and methods.

22. Identify the steps involved in closing out a residential construction project from punch-out to end of warranty period for a large development project.
23. Apply the principles of engineering economy to complete a simple pro forma analysis to determine the rate of return for a development proposal.
24. Identify and explain the seven roles and disciplines: land acquisition, land development, estimating and purchasing, construction operations, finance, marketing, and sales.
25. Apply strategic and operational marketing to a particular neighborhood.
26. Recall and explain the standard sequence of activities associated with the typical residential construction schedule.
27. Become proficient with the techniques and procedures of the Microsoft Project scheduling computer program. Demonstrate that skill by using it to create a plot of the schedule for a construction project.
28. Acquire skill in basic analytical and networking techniques in the areas of planning, scheduling, and cost engineering as applied to the management and control of residential construction projects. Demonstrate that skill by taking plans and specifications for an actual construction project of moderate complexity and creating an appropriate project schedule. Steps to include scoping the work, create the Work Breakdown Structure (WBS), identify and define activities using correct level of detail, and estimating activity durations.
29. Be able to explain concept of production planning and creation of production schedules.
30. Know different methodologies and when to apply those methodologies for estimating at different stages in the project life cycle –subcontractor bid review.
31. Analyze a set of working drawing and specifications to determine the type of materials needed, units of measure, and be able to determine the quantities of the various materials required by the documents.
32. Present a logical, complete and accurate listing of the materials and their quantities in a format which then could be priced and labor analysis performed on it.
33. Analyze a set of specifications and drawings to determine the basic labor, material, equipment, and subcontractor requirements.
34. Present a logical, complete and accurate estimate including pricing for a variety of cost items.
35. Become familiar with computerized estimating - advantages & disadvantages.
36. To have extensively used specifications and plans for all exercises.
37. Understand estimating procedures based on competitive product/market analysis.

## **Student and Program Learning Outcomes**

The American Council for Construction Education (ACCE) is the accrediting body for Cal Poly's construction management program. The ACCE requires achievement of 20 student learning outcomes (SLOs). The construction management program has identified 20 program learning outcomes (PLOs) that equal or exceed the ACCE SLOs and 5 additional idiosyncratic PLOs.

This course supports the following PLOs:

- PLO 1: Create written communications appropriate to the construction discipline.
- PLO 2: Create oral presentations appropriate to the construction discipline.
- PLO 4: Create construction project cost estimates.
- PLO 5: Create construction project schedules.
- PLO 6: Analyze professional decisions based on ethical principles.

PLO 7: Analyze construction documents for planning and management of construction processes.

PLO 8: Analyze methods, materials, and equipment used to construct projects.

PLO 10: Apply electronic-based technology to manage the construction process.

PLO 13: Understand construction risk management.

PLO 15: Understand construction quality assurance and control.

PLO 18: Understand the basic principles of sustainable construction.

PLO 19: Understand the basic principles of structural behavior.

PLO 20: Understand the basic principles of mechanical, electrical and plumbing systems.

PLO 21: Understand the role construction managers play in enhancing the needs of society.

PLO 23: Understand the key leadership characteristics that are successful in building and strengthening construction management teams.

PLO 24: Understand the importance of recognizing culture differences and role culture plays on influencing project success for a construction team.

PLO 25: Understand the benefits of respecting the unique and diverse backgrounds individuals bring to a construction team.

### **Topical Outline, Outcomes, and Method of Assessment**

This course has embedded assessment instruments for the PLO(s) listed below:

N/A

An overview of content, course learning outcomes, program learning outcomes, instructional activities, and assessment measures, is listed in the table below.

<b>Week</b>	<b>Topical Outline</b>	<b>CLOs</b>	<b>PLOs</b>	<b>Instructional Activities</b>	<b>Method of Assessment</b>
1	Residential Industry Overview	1, 3-7, 24, 25	1, 2, 6, 7, 10, 21, 23-25	Lecture, Activity, Lab	1, 3, 5
2	Residential Foundations	8-11, 29-36	1, 4, 5, 7, 8, 10, 19, 20	Lecture, Activity, Lab	1, 2, 3, 5
3	Residential Structures and Framing	8, 26, 29-36	1, 4, 5, 7, 8, 10, 18, 19	Lecture, Activity, Lab	1, 2, 3, 4, 5
4	SST Building Lab	12, 14, 21, 26	23-25	Lecture, Activity, Lab	6
5	MEPF Systems	2, 8, 18, 21, 26, 29-36	1, 4, 5, 7, 8, 10, 15, 18- 20	Lecture, Activity, Lab	1, 2, 5

Week	Topical Outline	CLOs	PLOs	Instructional Activities	Method of Assessment
6	Exterior (Air and Water) Systems (roofing, siding, fenestration, etc)	8, 15-17, 21, 26, 29-36	1, 4, 5, 7, 8, 10, 15, 18	Lecture, Activity, Lab	1, 2, 3, 4, 5
7	SST Building Lab	12, 14, 21, 26	23-25	Lecture, Activity, Lab	6
8	Interior (thermal) Systems (insulation, drywall, etc.)	8, 13, 18, 21, 26, 29-36	1, 4, 5, 7, 8, 10, 15, 18	Lecture, Activity, Lab	1, 2, 3, 5
9	Interior finishes (flooring, trim, cabinets, fixtures, etc.)	8, 20, 21, 26-37	1, 4, 5, 7, 8, 10, 15, 18	Lecture, Activity, Lab	1, 2, 3, 4, 5
10	Residential Development Proposal	22, 23, 37	All	Lecture, Activity, Lab	7

Several learning assessments will be used throughout this course. A numerical listing is below and each number corresponds to the method of assessment column.

1	Lab Assignment	5	Quiz
2	Estimating Assignment	6	Tiny House Build
3	Scheduling Assignment	7	Final Project Proposal and Presentation
4	Exam	8	

## Required Texts/Reading

### Textbook

Kelting, S. (2011), Residential Construction Methods and Materials, Clifton Park, NY: Delmar Cengage Learning. Lessons 1-30. (ISBN 9781133281665). Available at University Bookstore and on-line at [cengagebrain.com](http://cengagebrain.com).

### Other Readings

Any supplemental reading will be posted on the course PolyLearn page.

### Other Equipment/Material Requirements

CM 115 Packet (from previous class), Laptop, MS Office including MS Project, Personal Protection Equipment (Hard Hat, Safety Glasses, Vest, and Closed Toed Shoes), Framing Hammer, 25' Tape measure, Philips Head Screwdriver, Flat Head Screwdriver, Speed Square, Utility Knife, Carpenter Pencil, Tool Belt (small-medium).

## Technology Requirements

Bluebeam, a project workflow and collaboration software, will be used extensively throughout the course, starting in Week 2, and a free license will be provided. Additional license information is available in Technology Resources in PolyLearn.

### Laptop Policy:

The department has a requirement that all students have a notebook computer. Most Construction Management classes emphasize cooperative projects/assignments, and a notebook 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 notebook computer is the key to having computing capability available at all times and all locations. Financial aid may be available to cover the cost of the computer laptop. Go to the Cal Poly Financial Aid Office website <http://financialaid.calpoly.edu/> for more information.

For more detailed information about laptop specifications see the CM website: <http://www.construction.calpoly.edu/content/prospective/laptop-requirements>.

## Classroom Protocol & Your Responsibilities as a Student

Students are expected to attend all classes and to have completed assignment and relevant reading before coming to class. Quizzes will be based on the assigned reading and relevant presentation materials. Students are encouraged to participate in class discussions and to ask questions.

As a professional student, you are responsible to:

- Be punctual and present, physically and mentally, at every class session for the entire class period
- Utilize technology responsibly to limit distractions for your peers and instructor
- Be polite and respectful towards others, instructors, and students
- Limit distracting or disruptive behavior

So, although I allow the use of cell phones and laptops in class, they are there as a tool for your learning, not to distract you, others, or the instructor. If they become a distraction, I will ask you to put them away.

Additionally, I do not allow any inappropriate language in my classroom, so do not use profanity and treat others with respect. Basically, if I don't allow my 6-year old child to say it, I won't allow you to say it. This includes the words: stupid, idiot, retarded, etc. You are working towards earning a degree, you can be more articulate than that. Please consult the list in PolyLearn of all words that should not make their way into the classroom.

## Assignments and Exams

Description	Percent
Exams (3 Exams at 10% EA)	30
Assignments, Quizzes, Participation	20
Labs (Individual & Team submittals)	20

Final Project Proposal (Binder and Presentation)	20
SST Participation	10
<b>Total Possible</b>	<b>100</b>

## Late/Missed Work and Make-Up Policy

Late work with valid, documented absences will not result in penalization.

Late work without a documented absence is accepted, however:

- Only with prior approval from the instructor BEFORE the assignment is due
- Only within 1 week of the original due date
- At a penalty of 10% of your grade

If you turn in work more than one week after the original due date, you will receive 0 points on the assignment, but please do the work in order to understand the material and prepare for the exam.

You will have the opportunity to submit one assignment up to three calendar days late with no penalty, no questions asked. This may only be used once, and only for an individual assignment, not a team project.

Failure to attend a scheduled exam or in-class assignment will result in a grade of 0. There are no make-up exams unless prior approval has been granted by the instructor.

## Grading Policy

Various forms of evaluation of student work will be implemented throughout the quarter. Grades will be based on various PolyLearn activity modules (individual and team assignments, lessons, blogs, etc.), in-class activities, quizzes, and exams. Extra credit may or may not be available.

The final exam for this course will take place on the last day of the course.

Listed below is the grading scale for this course.

Letter Grade	Percentage	Performance	Definition
A	93 – 100%	Excellent Work	Superior Attainment of Course Learning Outcomes
A-	90 – 92%	Mostly Excellent Work	
B+	87 – 89%	Very Good Work	Good Attainment of Course Learning Outcomes
B	83 – 86%	Good Work	
B-	80 – 82%	Mostly Good Work	
C+	77 – 79%	Very Acceptable Work	Acceptable Attainment of Course Learning Outcomes
C	73 – 76%	Acceptable Work	
C-	70 – 72%	Mostly Acceptable Work	

Letter Grade	Percentage	Performance	Definition
D+	67 – 69%	Mostly Poor Work	Poor Attainment of Course Learning Outcomes
D	63 – 66%	Poor Work	
D-	60 – 62%	Very Poor Work	
F	0 – 59%	Failing Work	Non-Attainment of Course Learning Outcomes

## Diversity and Inclusion

Cal Poly considers the diversity of its students, faculty, and staff to be a strength and critical to its educational mission. Cal Poly expects every member of the university community to contribute to an inclusive and respectful culture for all in its classrooms, work environments, and at campus events. For more information on resources related to diversity and inclusion, please visit the Office of University Diversity & Inclusivity website at [diversity.calpoly.edu](https://diversity.calpoly.edu).

### What inclusion looks like in my classroom

I embrace diversity in the field, workplace, classroom, and industry, be it gender, race, ethnicity, age, socioeconomic status, culture, education, religion, or sexual orientation. We all bring diverse perspectives and experiences, which allows us to be innovative thinkers and problem solvers. Teams with greater diversity provide better perspective and solutions to problems. Having a mix of people fosters creativity and excitement.

Getting this mix to work well can take time. Oftentimes, diverse people come together for a common goal, for example in our industry the goal could be successfully executing a project. When diverse people are gathered around a common interest, they can focus on the things they agree on or have in common, rather than the items that make them different. However, in the solution, each person should be given a chance to give their perspective or provide input on the problem without being singled out. In the classroom, I provide an inclusive environment where everyone is valued, respected and supported so everyone can perform to their full potential.

## Basic Needs: Food, Housing, Financial, and Mental Wellbeing

Basic needs insecurity is a growing struggle that impacts students' academic and mental and physical wellbeing. When students have inconsistent access to nutritious food, housing, financial instability and mental health instability, a student's retention and progress to graduation can be negatively impacted.

At Cal Poly, 1 in 4 students are food insecure, meaning they struggle to acquire food. Factors like increasing cost of higher education, lack of awareness of available support, and stigma and shame have increased the risk of undergraduate, graduate, and professional students being basic needs insecure.

If you are one of those students who faces challenges securing food, housing or other basic needs, you are not alone and Cal Poly can help. We invite you to learn about the many resources available to support you through Cal Poly's Basic Needs initiative at [basicneeds.calpoly.edu](https://basicneeds.calpoly.edu).



## **University Policies**

### **Participation and Attendance**

Active participation and attendance are both required and expected. Class participation includes four components: (1) attendance; (2) thorough preparation for each class meeting including (a) reading assigned materials, and (b) preparation to address questions for each class session; (3) active and full participation in small and large group activities; and, (4) timely completion of all assignments.

Students are responsible for knowing the University policy regarding class attendance. See this link on [Class Attendance Policy](#) provided on the university website.

### **Add/Drop Policy**

Students are responsible for knowing the University policies, procedures, and schedule for dropping or adding classes. See this link on [Add/Drop Policy](#) provided on the university website.

### **Academic Integrity**

Students are responsible for knowing the [Academic Honesty Policy](#).

### **Students with Disabilities**

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Disability Resource Center, Building 124, Room 119, at (805) 756-1395, as early as possible in the term, as accommodations may take several weeks to arrange. If you are a student with a disability, please consider discussing your needs and possible accommodations with me as soon as possible, and visit the [DRC Website](#) for additional information.

### **SensusAccess**

SensusAccess is a self-service, alternate media solution made available by Kennedy Library to automatically convert files into a range of alternate media including audio books (MP3 and DAISY), e-books (EPUB, EPUB3 and Mobi) and digital Braille. The service can also be used to convert inaccessible files such as image-only PDF files, JPG pictures and Microsoft PowerPoint presentations into more accessible and less tricky formats. This service is available at no charge for all Cal Poly students, faculty, staff and alumni. For additional information, visit [SensusAccess at the Kennedy Library](#).

### **Technical Support and Contact Information**

Support is available for troubleshooting and access issues for PolyLearn. Please visit the [PolyLearn Student Support Web Site](#) for further information.

### **Campus Resources to Support Student Learning**

Cal Poly offers programs and resources that are available to assist students during your academic studies, such as the [Cal Poly Student Academic Services Web Site](#).