Course Title: Senior Project
Physics 461, 462 (theoretical projects)
Physics 463, 464 (experimental projects)

The Bachelor of Science requires both quarters of Senior Project. The Bachelor of Arts requires just the first quarter. Your supervisor will tell you which course numbers are appropriate for your project. Students enroll during the first two weeks of the quarter using permission numbers obtained from the Physics Department Office.

Catalog Description:

PHYS 461, 462 Senior Project I, II (2) (2)
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. Prerequisite: Consent of instructor.

PHYS 463, 464 Senior Project - Laboratory Research I, II (2) (2)
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 120 hours total time. 2 laboratories. Prerequisite: Consent of instructor.

Expected Learning Outcomes:

1. Students will understand the scientific research process as a search for the answer to an open-ended question on a topic agreed upon with their research supervisor.

2. Students will know how to conduct a review of relevant literature related to their chosen research project using library and web resources.

3. Students will gain the technical competence to complete the project work.

4. Students will be able to communicate the results of their project in a well-formatted, meaningful report aimed at their peers and technically competent laypeople. Reports will include an abstract, introduction, theoretical background and motivation for the research, the results of the student's personal work on the topic, and a conclusion.

5. Students will know how to re-scope a research project in the event that unexpected barriers to completion arise.

Guidelines for choosing a project:

Senior project may be the first research experience you do, or it may be a continuation of things you started independently with Cal Poly faculty. It's a great opportunity to see if research excites you and to try doing physics that you may want to pursue in your career after Cal Poly. You might instead choose to explore something exotic because you might never get the chance to do it later.

In selecting a project, you'll want to think about your skills and the kind of work you most enjoy. What are your favorite physics courses? Talk to your professors about who's doing research related to your favorite classes. Also, search the department web page maintained by faculty that describes their research projects. This will help you narrow your search for a senior project to faculty who conduct research in areas you will enjoy.

If a professor's research sounds interesting, **contact them as early as possible** to discuss research opportunities. Most professors will be able to guide you to a project that they are interested in working on with you. And if they don't have an opening, they may be able to direct you to someone else who is looking for students. Don't be intimidated!

Time and scheduling:

Students are expected to spend a ***minimum of 60 hours per quarter (6 hours per week)*** on their project. Meeting times and lab hours are to be arranged with supervisors.

Grading:

Evaluation is based on the degree to which the final report and general activity during the course of the project demonstrate the student's mastery of the learning outcomes. Generally, the grade for PHYS 461(463) will cover the project work and the grade for PHYS 462(464) will cover the project write-up. Minimum effort will earn a minimum grade of C. Projects executed with exceptional quality will earn better grades. Less than the minimum effort, or incomplete projects will receive a grade of D, F, RP, or I. *The supervisor will explain their specific grading policy to the student in the first meeting.*

What to Expect:

Although the details of the organization of each senior project varies from student to student, a typical schedule is as follows.

A. At the first meeting with the chosen supervisor, the supervisor will give an overview of their research, find out what the student interests and experience are, and introduce possible project ideas to the student. The supervisor will also explain their grading policy.

B. At the second meeting, the student will bring the relevant forms from the physics department office for the supervisor to sign. The student and supervisor will agree on the project, a schedule for class meetings, and complete the paperwork, to be turned in by the student.
C. At the third meeting, the student will bring an outline of their final project report to discuss, revise and agree on with the supervisor. The outline will remain a working document that can and will likely evolve as the research progresses.
D. The student will continue work on the project, keeping track of the hours spent each week and reporting progress and hours to their supervisor at their arranged meeting times.
E. At the beginning of the **final quarter of senior project**, the student and supervisor will review the project outline from which the student will develop the Table of Contents for their written report. The student and supervisor will set the schedule for delivery of the components of the written report.
F. **The first complete draft of the report should be turned in to the supervisor at the beginning of the seventh week of instruction.** Revisions will be returned to the student during the eighth week.
G. **The final draft of the senior project should be turned in to the supervisor at the beginning of the tenth week of instruction** for review and grading.

Public Presentation

Students are expected to present their research at a professional research conference and/or the CoSaM Research Conference. It is up to you and your supervisor to choose the appropriate venue. (Instructors may make this a requirement to receive an A grade.)

CoSaM Research Conference

In the spring quarter (~mid-May) every year, the College of Science and Math holds its annual student research conference. Students are invited to submit abstracts for poster or oral presentations on the research they have conducted, to be shared with the University community at a two-day on-campus research conference. Students are strongly encouraged to plan in advance to participate.

Longer-term projects

In the event that a project is not completed within the two-quarter limit of PHYS 461(463) and 462(464), students (in consultation with their supervisor) may sign up for additional units of independent study (PHYS 400) with the supervisor to continue related work and complete their write-up. Alternatively (at their discretion) the supervisor may choose to hire the student with their research funding as a student assistant to continue/complete the work. In such cases, the grades assigned for the senior project and/or graduation may be delayed.

Paid research vs. instructional credit

Since students receive academic credit for the completion of PHYS 461(463) and 462(464), they should not expect to be paid for work done to satisfy the requirements of the course. Supervisors with external research funds who wish to pay students to work as their assistants may do so, but the paid hours should only be for those above and beyond the minimum 6 hours per week of instructional time.

Report formatting and submission:

Please refer to the library guidelines for formatting and submission to the Digital Commons. Projects can be held privately or distributed publically. All authors and supervisors should agree on the type of distribution before the project is submitted.

Examples of Project Reports:

Please refer to recently completed senior projects in physics on the Digital Commons website for examples.