

## EE 496 Capstone Design Project

**Credits:** EE and CENG students are required to take at least 3 credits. If the project spans multiple semesters, a minimum of 2 credits per semester is required, to satisfy simultaneous W and O focus requirements.

**Categorization of credits:** engineering topic

**Instructor(s):** All EE faculty

**Textbook and Other Required Materials:** Varies with projects and is determined by the faculty advisor.

**Designation:** Required

**Catalog Description: EE 496 Capstone Design Project (V)** Significant project integrating the design content of previous courses and incorporating engineering standards and realistic constraints. Written report must document all aspects of the design process: reliability, safety, economics, ethics. Repeatable unlimited times. A-F only. Pre: 396 or consent.

**Pre- and Co-requisites:** Pre-requisites: Senior standing and EE 396 Junior Project.

**Class/Lab Schedule:** Meetings arranged by the student and faculty advisor.

**Topics Covered:** EE 496 is a significant and advanced-level design project that integrates the design content of previous courses under the supervision of a faculty advisor. It can be an individual or team project, where the team may be a mix of beginning to advanced-level students. The project may be a continuation of an EE 396 project, an entirely new project, or a continuation of an earlier EE 496 if it spans multiple semesters. The project must cover at least two of the following four topics: *(i)* data collection and analysis; *(ii)* design methodology; *(iii)* design tools; and *(iv)* instruments. It must incorporate engineering standards and realistic constraints that include most of the following considerations: economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. The number of hours dedicated to each topic depends on the project that is undertaken.

### **Course Objectives and Relationship to Program Objectives:**

The design experience is necessary to prepare students to become professional engineers. EE 496 places significant design responsibility on the students as they must plan and execute a major design problem. To prepare for EE 496, students must take at least one credit of EE 296 Sophomore Project and two credits of EE 396 Junior Project. The EE 496 capstone project gives students exposure to what they will see in the engineering industry with opportunities to work in teams, develop leadership skills, and work on more open-ended design projects. [The course addresses the following Program Objectives: 1, 2, 3, 4, 5.]

A student demonstrates advanced-level design as part of a project. Project activities include most of the following: design, data collection and analysis, and learning design methodologies, design tools, instruments, engineering standards, and practical constraints.

The course has requirements of written reports and oral presentations. The sections below describe the minimum of these requirements. A faculty advisor may have additional

requirements and procedures that would be appropriate for the project. For example, the advisor may require other students (e.g., team members) to evaluate oral presentation performance along with the advisor. Requirements, procedures, and scope of the project should be discussed at the initial meeting with a candidate advisor before registration.

Reports and presentations should be of professional quality, prepared using modern tools such as word processors for written reports, and computer presentation tools (e.g., powerpoint) for oral reports.

The course has both writing intensive (W) and oral (O) focuses and therefore must meet the hallmarks described here

(adapted from UH General Education Office, “Hallmarks of Writing Intensive Classes <https://manoa.hawaii.edu/gened/req/focus/>):

- The course uses writing to promote the learning of course materials, including, but not limited to, progress reports and a final report
- The course provides interaction between the instructor and students while students do assigned writing, in the form of comments on drafts.
- Written assignments contribute at least 40% to each student’s course grade.
- The course requires students to write a minimum of 4,000 words, or about 16 pages.
- To allow for meaningful professor-student interaction on each student’s writing, the class is restricted to 20 students.

(adapted from UH General Education Office, “Hallmarks of Oral Communication Classes <https://manoa.hawaii.edu/gened/req/focus/>)

- Each student will conduct or participate in a minimum of three oral communication assignments or a comparable amount of oral communication activity during the class. In addition, at least 40% of the final grade for a 3-credit course will be a function of the student's oral communication activities (30% for a 4-credit course; 60% for a 2-credit course).
- Each student will receive explicit training, in the context of the class, in oral communication concerns relevant to the assignment or activity.
- Each student will receive specific feedback, critiquing, and grading of the oral communication assignments or activities from the instructor.
- If instructor feedback primarily involves individual or paired students, enrollment will be limited to 20 students. If instructor feedback primarily involves groups of students, enrollment will be limited to 30 students.
- The course will be numbered at the 300- or 400-level.

If the project spans multiple semesters, a minimum of 2 credits per semester is required, to satisfy simultaneous W and O focus requirements.

### **Written Reports**

EE 496 is a *writing intensive (W)* course and must conform to the *W Hallmarks* listed above. The

course includes an emphasis on instruction in writing project reports. Rubrics for evaluating written assignments can be found on the Department website.

If a student takes multiple EE 496s to complete a project (e.g., two credits of EE 496 in one semester and two credits of EE 496 in the next semester), *each* EE 496 is writing intensive and must conform to the W hallmarks. If the project is undertaken by a team of EE 496 students, each EE 496 member of that team must fulfill all of the W hallmarks; specifically, each EE 496 student must write a minimum of 4000 words.

EE 496 requires a written final report, which must cover the following items:

- Project objectives and criteria
- A discussion of related work and how the project is different.
- Final design
- Alternate solutions
- Explanation of how previous and concurrent course work is related to the project.
- Future work or subsequent development
- At least two of the following four topics: Data collection and analysis, Design methodology Design tools, Instruments
- Engineering standards and practical constraints including most of the following considerations: Economic, Environmental, Sustainability, Manufacturability, Ethical, Health and safety, Social, Political

**Oral Presentations** EE 496 is an *oral communication focus (O)* course and must conform to the *O Hallmarks* listed above. It requires participation in a poster session that is organized by the Department. Rubrics for evaluating posters can be found on the Department website. Students are encouraged to choose their own poster style to effectively present their project. Example posters and poster templates can be found on the Internet, from faculty advisors, and from other students.

In addition to the poster session, students should give other oral presentations, where the faculty advisor will provide feedback. The presentations, including the poster session presentation, should total 30 minutes or more. These presentations can be given midterm such as progress reports, and at the end of the semester such as final demonstrations.

Only students who satisfactorily complete the oral communication assignments will be allowed to pass the course with a D or better.

**Course Outcomes and Their Relationship to Program Outcomes** The following are the course outcomes and the subset of Program Outcomes (numbered 1-7 in square braces "[ ]") they address:

- Accomplish advanced-level design with respect to engineering standards and practical constraints. [1, 2, 7]
- Learn new design methodologies; tools; techniques for data collection and analysis; and/or instruments with minimal instruction from the faculty advisor. [7]
- Orally communicate design and engineering concepts effectively. [3]
- Prepare clear written reports. [3]

**Contribution of Course to Meeting the Professional Component:**

Engineering topics: 100%

**Computer Usage:** Varies depending on the project. However, oral and written presentations are to be of professional quality and should be prepared using computer tools.

**Design Credits and Features:** The course has 3 design credits. The course and all of its assignments are dedicated to advanced-level design experience for senior-level students.

**Person(s) Preparing Syllabus and Date:** Galen Sasaki for the Undergraduate Curriculum Committee, Feb. 17, 2003. Revised, Wayne Shiroma, Jan. 23, 2006, Dec. 13, 2008, Feb. 7, 2014. Revised, Yingfei Dong, Oct. 7, 2014. Revised Wayne Shiroma Mar. 11, 2019, Oct. 14, 2019. Revised, Matthias Fripp, Jan. 21, 2021. Revised Wayne Shiroma, Jan. 30, 2024.