Catalog Description:

Student teams select and research a design project and propose a design which is implemented, tested and evaluated. Progress reports, a written final report and an oral presentation are required. One hour lecture, one hour recitation, 5 hours lab. Prerequisite: Senior standing and EECS 3100 or EECS 3420.

Course Goals:

This course serves as a capstone course, highlighting and exemplifying the academic achievements of students in both the electrical engineering and the computer science and engineering programs. As such, it incorporates several of the following evaluation criteria for engineering programs:

1. Ability to apply knowledge of mathematics, science and engineering.
2. Ability to design and conduct experiments, as well as to analyze and interpret data.
3. 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. Ability to function on multi-disciplinary teams.
5. Ability to identify, formulate, and solve engineering problems.
6. Understanding of professional and ethical responsibility.
7. Ability to communicate effectively.
8. 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. Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

Additionally, and specifically, the course goals include:

Instruction on the elements of the engineering design process.
Design team experience on a multi-disciplinary team.

Course Requirements:

a) Course instructor—an EECS faculty member is assigned the Senior Design Class for a given semester and is responsible for directing the course. The instructor conveys course requirements information to the students, provides for lectures (may be given by guest speakers) on topics related to the engineering design process, and directs the students to resources available on campus such as the Writing Center and Library. The instructor collects submitted materials, enforces deadlines, reads and grades the progress reports and issues a grade for each enrolled student at the end of the semester.

b) Student participation—each student is responsible for serving as a contributing member of a design team and for attending lectures, team meetings, and meetings of the team with the instructor.
c) Team experience—each design team will consist of 2 – 4 team members. “Teams” of one student are not permitted and groups of 5 or more must be divided. Each design team will designate one member as “leader.”

d) Faculty advisor—each design team is required to select an EECS faculty advisor. The faculty advisor serves in the capacity of “technical consultant” and “evaluator” for the project. The faculty member is approached by the leader of the team and is designated “faculty advisor” for the team by mutual agreement between the design team and the faculty member. The faculty member will grade the team’s project according to “overall quality and achievement” and will read and grade the team’s Project Proposal and the Final Report.

e) Project selection—the idea for the project may come from a design team member or members, a faculty member, or an “industrial partner” outside the university. “Projects” already completed through co-op or previous work experience are not acceptable for this class. The project idea is subject to approval by the faculty advisor and the course instructor.

f) An EECS student may elect to work with a senior design project team from another engineering department, provided that the contribution of the EECS student is appropriate to the project. The EECS student must obtain an EECS faculty advisor who will coordinate with the faculty advisor from the other department working with the project team. The project must be approved by the other department project advisor as well as the EECS faculty advisor. The EECS student will register for the Senior Design course, EECS 4000. The EECS 4000 course instructor should determine the mechanism for the student to complete all EECS 4000 course requirements, in addition to participation on the project design team. This will involve attending Senior Design lectures and other instructional/informational meetings offered by the EECS course or that of the other department or a combination of both. Evaluation and grading of the EECS student will be provided by the EECS faculty advisor, in coordination with the course instructor and the faculty advisor from the other department.

Note: The next three items refer to required written documents. Documents submitted will be in typed-text form (produced by a word processor), single-sided, with space-and-one-half line spacing. All documents submitted must include the required content, be well structured, and exhibit correct grammar, spelling, and punctuation. Documents will include figures, tables, and appendices, as appropriate. References will be given in a section at the end of the document and each reference will be cited in the text of the document. Documents must be bound or otherwise consolidated as stipulated by the course instructor.

g) Project proposal—each design team submits one project proposal document. Proposals will be about 8 – 12 pages in length. The proposal will include the following parts (additional parts may be specified by the instructor), clearly identified as separate sections in the document:

i. Title page—include the name of the project, the names of the students on the team, and the names of the faculty advisor and course instructor.

ii. Abstract

iii. Problem Definition/Purpose of the Project—What is needed? What will be supplied at the completion of the project?

iv. Goals of the project. What qualities should the final product have? What needs does the project aim to satisfy?

v. General Design Alternatives—What are some alternative solutions to this problem?

vi. Method Selection Criteria—How will the solution method be chosen?

vii. Ethical Considerations and Societal Impact—What are the ethical issues involved (with the project and/or with the solution) and what are the potential benefits/risks to society?

viii. Project Schedule—give a realistic timetable for completion of the project including acquiring resources, implementation, testing and evaluation.
ix. Division of Labor—give a list of general assignments for the team members, by name, including the team leader.
h) Progress reports—each design team is required to submit at least two progress reports. The progress reports will generally be brief (3 – 5 pages in length) and include the following (additional parts may be specified by the instructor):
  i. Title page as stated above.
  ii. Brief statement and description of the project.
  iii. Design process to date: steps to project definition, solution alternatives considered and their evaluations, assignments to each member of the team and their accomplishments to date, current overall status of the project, revised timetable to completion.
i) Final report—each design team submits one final report. The number of pages in the final report will be usually in the range of 25 – 40 pages. The final report will include the following parts (additional parts may be specified by the instructor) clearly identified as separate sections in the document:
  i. Title page—Give the name of the project. State the following:
     EECS Department Senior Design Project Final Report
     Names of the students on the design team
     Name of the faculty advisor
     Name of the instructor
     Date of the report
  ii. Abstract—limit this to 100 words. Briefly cover the nature of the project, its purpose, and summarize the results.
  iii. Introduction/Background—inform the reader of the problem addressed by the project. Give a short history of the general area, if appropriate. Consider that your reader is generally technically literate but not necessarily a specialist in the area.
  iv. Goals of the project—clearly state the team’s goals for this project (by which the resulting project may be judged).
  v. Solution method—cover the design process, any alternatives that the team considered or attempted. You may recount the decision process experienced by the team, the choices made at different points in the process. Describe any mistakes, “dead-ends,” or “blind alleys” encountered. Describe the methods used in implementing and testing the final product.
  vi. Description and Evaluation of Project—describe the implemented project resulting from the team effort. Evaluate the project by how closely the project satisfies the goals.
  vii. Summary with Ethical/Societal Considerations—Summarize the success of the project, work that remains, and possible future directions. Evaluate any ethical/societal concerns with this project regarding its use (or abuse) for the complete life cycle of the project (examples: recycling, reuse, obsolescence, disposal, need for continuing maintenance and upgrades, personal safety, and the secure collection, storage, and deletion of protected data).
j) Oral presentation—Each design team will give a 10 – 15 minute oral presentation summarizing the project, describing the methods used, and emphasizing the result. Each member of the design team will be present for the presentation, dressed in professional/business attire, and have a speaking part. At the end of the presentation, the members of the design team will address any questions presented by members of the audience.
**Suggested Timetable:**

<table>
<thead>
<tr>
<th>Week</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Design teams are formed and a team leader is designated. Team membership and contact information are communicated to the instructor.</td>
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<tr>
<td>1-2</td>
<td>Design teams meet outside of class to select a design project and faculty advisor.</td>
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<tr>
<td>3</td>
<td>Design team submits proposal document to instructor. Instructor schedules a meeting with each team to review proposal.</td>
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<tr>
<td>6</td>
<td>Each design team submits a progress report.</td>
</tr>
<tr>
<td>11</td>
<td>Each design team submits a progress report.</td>
</tr>
<tr>
<td>14</td>
<td>Final report is due at end of next-to-last week to allow evaluators to read report prior to the final presentation.</td>
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<tr>
<td>15</td>
<td>Oral presentations.</td>
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**Suggested Weights for Grading:**

A score out of a possible 100% will be assigned each student. A student’s score may be part team score and part individual’s score. The division of the 100 point score is determined by the course instructor with input from the project faculty advisor.

- **30 – 50%** Score for overall quality and achievement.
- **20 – 30%** Score for written requirements: proposal, progress reports, and final report. The written component is a major part of this design experience and should be weighted accordingly.
- **10 – 25%** Oral presentation score. This may be given as a team score, an individual score, or both.
- **0 - 10%** Individual’s contribution score (score given to each team member, determined by the other members of the team). This score may include a weight for attendance.

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1 “Criteria for Accrediting Engineering Programs, Effective for Evaluations During the 2005-2006 Accreditation Cycle,” ABET Engineering Accreditation Commission