ECE 480—Senior Design

Required or elective: Required

Course description: Electrical engineering and computer engineering senior design experience involving contemporary design tools and practices, engineering standards, ethics, cross-functional teaming, and oral and written technical communication, lifelong learning.

Prerequisite(s): (ECE 303 and ECE 313 and ECE 320 and ECE 331 and ECE 366 and (ECE 390 or concurrently)) or ((CSE 410 and (ECE 390 or concurrently)) and completion of Tier I writing requirement).

Textbook(s) and/or other required material: Mike W. Martin and Roland Schinzinger, "Ethics in Engineering," McGraw-Hill, New York, 1996 (3rd ed.)

Current literature found in trade journals, professional-society publications, manufacturer's publications, etc. related to the course learning objectives.

Course objectives:

At the completion of this one-semester course, each student should have actively participated as a member of an engineering design team and made significant contributions to achieving the team's stated goal and objectives. Specific team activities should include: 1) propose an engineering design project that has clearly stated design criteria, which includes realistic constraints; 2) share in the day-to-day design activities and management of the project; 3) share in the presentation of oral and written progress reports; 4) share in the demonstration of results at key milestones during the life of the project; and evaluate the project's progress and outcomes against a clearly articulated set of criteria.

At the completion of this course, each student should be able to:

- describe the reasons and forms of technical communication;
- write technical reports;
- write a team proposal for major design project and obtain approval;
- understand and be able to work collaboratively on writing projects;
- comprehend the content and style of oral presentations;
- understand the importance of career planning and management;
- comprehend the importance of engineering ethics;
- access relevant standards and interpret their meaning and application;
- delineate the principal design criteria and constraints for an electrical or computer engineering design project—e.g., cost, size, power, environmental factors, reliability, safety, maintainability, and reusability;
- describe and understand the overall engineering design process—e.g., project justification, identification of constraints, establishment of design criteria, establishment of timetables, the partitioning of work, project monitoring, and project evaluation;
- describe and understand contemporary industry practices and trends with respect to electrical and computer engineering;
- describe, understand, and apply key tools used in the overall electrical and computer engineering design process;
- understand the benefits and potential problems of teaming, describe qualities and processes of effective teams, and describe the role of teamwork in system design;
- acquire and understand information contained in contemporary technical literature—e.g., trade journals, magazines, books, conference proceedings, and supplier literature—about hardware components, software, design tools, third-party suppliers, etc.; and
- browse the web to acquire information about electrical and computer engineering, software, design tools, third-party suppliers, etc.

Class/laboratory schedule: 4 (2-6)—Flexible lecture and lab schedule to accommodate the overall course learning objectives.
Topics covered

- Open-ended design
- Proposal writing
- Oral presentations
- IEEE & other professional societies
- Career planning
- Engineering ethics & safety
- Design standards
- Team development
- Engineering design process
- Contemporary issues in ECE

Contribution of course to meeting the requirements of Criterion 5

- College-level mathematics and basic sciences—0 credits
- Engineering topics—4 credits with significant design—yes
- General education—0 credits

Relationship of course to program outcomes

1 = Strong Emphasis, 2 = Emphasis, 3 = No Emphasis

- An ability to apply knowledge of mathematics, science, and engineering
- An ability to design and conduct experiments, as well as to analyze and interpret data
- 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
- An ability to function on multi-disciplinary teams
- An ability to identify, formulate, and solve engineering problems
- An understanding of professional and ethical responsibility
- An ability to communicate effectively
- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- A recognition of the need for, and an ability to engage in life-long learning
- A knowledge of contemporary issues
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
- A knowledge of probability and statistics, including applications appropriate to the program name and objectives
- A knowledge of advanced mathematics, typically including differential equations, linear algebra and complex variables, and discrete mathematics
- Knowledge of discrete mathematics
- Knowledge of mathematics through differential and integral calculus, basic sciences, computer science, and engineering sciences necessary to analyze and design complex electrical and electronic devices, software, and systems containing hardware and software components, as appropriate to program objectives

Person(s) who prepared description

Erik Goodman, September, 2009