ME 4972 – Senior Design Project I

Credits and Contact Hours: 3 Credits. Two 180 minute meetings per week.
Instructors: Vito Moreno, Bryan Weber
Textbook: (recommended) *The Engineering Design Process,* by A. Ertas and J.C. Jones, John Wiley & Sons, Inc., 1993.

Specific Course Information:

a. Catalog Description: The first part of the senior design experience. It will cover topics on design process, planning, and costs. Design for manufacture and assembly will be covered. Both oral and written reports are required.
b. Prerequisites: ME 3250
Corequisites: ME 3227
c. Required, Elective or Selected Elective: Required

Specific Goals:

a. Course Outcomes:
After completing ME 4972/3 students should be able to:

1. Develop problem specifications.
2. Brainstorm alternative solutions to problems.
3. Select a final design approach and defend a critical design review.
4. Understand how to schedule, plan and manage a project using CPM or PERT methods.
5. Conduct analysis to substantiate design concepts.
6. Deliver written documentation and oral presentations of items 1-5.
7. Understand the ethical implications of engineering in the modern world
8. Understand importance of intellectual property in the modern competitive world.

b. Relationship of Course Outcomes to Criterion 3 Student Outcomes:

1) an ability to identify, formulate and solve engineering problems by applying principles of engineering, science and mathematics:
Students apply knowledge acquired in their undergraduate course work to the design of engineered systems and hardware.
2) an ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs:
Students demonstrate the ability to analyze and interpret the data from physical and/or numerical experiments and synthesize the results into a design meeting the objectives and needs of the project sponsor.

3) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions:
Students design and fabricate a system, component, or process to investigate basic principles or validate the final solution. This is done at both the sub element (unit) and full prototype levels and students use the data and resulting analysis to inform their design and recommendations to the project sponsor.
4) an ability to communicate effectively with a range of audiences:

Each senior design team makes 2 oral presentations each semester to an audience of their peers, faculty and sponsors. At the conclusion of this course, they are required to produce a written final report to the sponsors. In addition, at Senior Design Demo Day the teams demonstrate and provide oral presentations to faculty, judges, sponsors, and the general public.

5) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts:
Students acquire an understanding of professional and ethical responsibility through course presentations, realistic design constraint treatment, the application of regulated standards to their work (including environmental standards), and knowledge of patent and intellectual property law. Many of the students are required to understand, sign, and apply Non-Disclosure Agreements (NDAs) and Intellectual Property (IP) agreements with the sponsoring company.

6) An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate and apply this knowledge appropriately.
Students gain an appreciation of the need for life-long learning by conducting independent literature reviews and researching project-related problems. Students learn about life-long learning in professional development through presentations from working professionals and select alumni, and are formally introduced to graduate education as an opportunity for future intellectual development.

7) an ability to function effectively on teams that establish goals, plan tasks, meet deadlines and analyze risk and uncertainty:
The senior design capstone project requires students to work in multidisciplinary teams. The students must meet several deadlines through both semesters, including for written and oral communication of their work, and are required to establish specific goals and tasks for the project. Students are required to assess their progress during the semesters and determine ongoing risks to the completion of the project goals. Finally, some of the teams work in multi-disciplinary, cross-department teams, for example with the such as Electrical, Computer, and Materials Engineering departments.

Topics Covered:

- Computer-aided design
- Brainstorming
- Group dynamics
- Creativity
- Design process and life cycle design
- Oral presentations
- Reports and written presentations
- Design failure
- Project planning and critical path methods
- Benchmarking
- Product liability