GT 4823 Special Topics - Interdisciplinary Capstone Design (for Fall 2014)

Catalog Description: GT 4823 **Interdisciplinary Capstone Design** (1-6-3)

Prerequisites: Identical to existing major specific requirements
(i.e., for ME students, ME 2110, ME 3017, ME 3180 or ME 4315, ME 3210 (co-req) – SAME AS ME 4182,
for BME students, BMED 3610 (co-req), BMED 2300,
for ECE students, ECE 4011 and {ECE3020 and ECE3030 or ECE3025 and ECE3084)
for MSE students, MSE4410 or PTFE4110

Course Description: Seniors will work in teams to apply a systematic design process to real multidisciplinary problems. Problems selected from a broad spectrum of interest areas, including biomedical, environmental, mechanical, industrial design, electrical and thermal/fluids. Projects must be based on the knowledge and skills acquired in earlier course work, and incorporate appropriate engineering standards and multiple realistic constraints. Emphasis is placed on the design process, the technical aspects of the design, and on reducing the proposed design to practice. The course consists of faculty and guest lectures, prototyping in design studios, and a multidisciplinary team project.

Textbook: No text.

Reports: Regular oral progress reports, project design notebooks, written reports and final project documentation (described below) are to be written or presented. Hand sketches and calculations are suitable for weekly discussions / desk criticisms, but not for the formal written reports and presentations. The final project documentation should be done in appropriate modeling and drawing software as approved by the faculty. Requirements for peer evaluation.

Attendance: Attendance is strongly encouraged at all group meetings / work sessions, class lectures, and class presentation sessions. Each student is required to participate in the oral presentations during the semester and Capstone Design Expo at the end of the semester.

Topics Covered:

1. Project selection
2. Specification formulation within given constraints
3. Project planning, budgeting
4. Product and patent research
5. Industrial design
6. Market research
7. Manufacturing considerations
8. Entrepreneurship
9. Proof-of-Concept methods
10. Societal, environmental and sustainability considerations
11. Ethics, safety, product liability
12. Codes and standards
13. Professional licensure, FE/PE exams

Interactions with Sponsors & Mentors: Students will be required to provide weekly updates on their interactions with sponsors and mentors and their feedback on the projects.

Course Objectives:
Objective 1: As part of this course, students give oral technical presentations and written technical reports.
Objective 2: As part of this course, students work in interdisciplinary teams to meet a common senior design project goal.
Objective 3: As part of this course, students Provide regular written reports and attend regular team meetings with a faculty advisor.
Objective 4: As part of this course, students attend and present at the Senior Design Capstone Design Expo at the end of the semester.

Objective 5: As part of this course, students apply the knowledge gained from their undergraduate courses towards a culminating senior design project.

Course Outcomes:

Outcome 1: Students are capable of synthesizing knowledge and skills acquired in their undergraduate curriculum, in the context of a realistic design project.

1.1 Students identify relevant topics from earlier courses and apply them to their design project.
1.2 Students critically evaluate designs using engineering criteria and predictive usage.

Outcome 2: Students develop the ability to address a broad range of requirements, including most of the following: performance, economic, marketing, intellectual property considerations, manufacturing at various rates, ethical, and safety.

2.1 Students demonstrate an ability to identify and specify design requirements, from general problem descriptions within the applicable realistic constraints.
2.2 Students systematically develop a design from the problem statement to a detailed, proof-of-concept design meeting all of the specifications.

Outcome 3: Students are prepared for the professional design environment by learning how to learn, through teamwork and by enhancing student's communication abilities.

3.1 Students clearly communicate design ideas and information.
3.2 Students work collaboratively and responsibly as a team.
3.3 Students demonstrate the ability to facilitate their learning by identifying design issues and questions that require additional investigation, then formulating appropriate courses of action.

Explanation of deliverables:

Oral Project Proposal – The first oral presentation and report will describe the proposed project. Passing the Oral Project Proposal along with incorporating the associated comments by the faculty advisor constitutes acceptance and certification of the design project. This should occur near the beginning of the semester. Project scope may be changed, i.e., narrowed or expanded, with the concurrence of the mentoring faculty member.

Regular Oral Progress Reports – Periodic progress reports (weekly reporting may be required) where each report must include both team and individual contributions.

Project Design Notebooks – All team members must keep a project design notebook to capture salient project design concepts, meeting notes, experimental measurements, etc. These notebooks will be collected and individually graded by the project advisor/TA during the semester.

Written Reports -- Each design team must submit a formal, written intermediate and final reports that, in conjection with project documentation, is sufficient to allow project replication by a suitable engineering team, or, if appropriate, project continuation by another student team.

Project Demonstration -- Prior to the end of the semester, each team must demonstrate their project to their faculty advisor and compare functional results with project design goals and specifications. This demonstration could take place either during the final presentation or at a mutually convenient time. If the project is not suitable for a final demonstration, then some visual representation of project functionality should appear in the final presentation.

Peer evaluation -- Each design team should participate in a formal peer review process to assess both team and individual performance at both the project proposal and the project completion stages.

Final Project Documentation - Complete project documentation package must be submitted electronically to receive a grade for the course. This documentation, in conjunction with the final report, must contain, as a minimum, sufficient information for a different team to completely replicate the project.