MEC 440-441 (Mechanical Engineering Design I and II)

Course description:
This two-semester capstone design project sequence provides senior mechanical engineering undergraduate students with significant senior design experience to practice knowledge, motivate learning, prepare for their careers, collaborate, develop innovative techniques and serve the community.

Students will work in groups, designing and implementing their projects based on the total design methodology. The design process consists of the following major steps:
1. Teaming and project selection,
2. Market and user needs analysis,
3. Product design specification (PDS) initialization and updating,
4. Conceptual design,
5. Detail design,
6. Prototyping and testing.

The design process spans two semesters. The first semester will emphasize design and analysis. Students will go through the major design steps. By the end of the first semester, each team should generate a complete set of design details of the project, which is ready for fabrication. The second semester will emphasize implementation and testing. Students will fabricate and refine their prototypes, based on testing, to realize proposed functions.

To fulfill the course requirement, each design team needs to submit
1. The project proposal after choosing the project,
2. The first progress report after market and user needs analysis and PDS initialization,
3. The second progress report for conceptual design,
4. The third progress report for detail design,
5. The fourth progress report for prototyping and testing,
6. The final report.

Moreover, at the end of the first semester, each team needs to give an oral presentation of their design steps and results; and at the end of the second semester, each team needs to give an oral presentation of their design and implementation process, and demonstrate their prototype.

Prerequisites: MEC 300, 310, 317, 320, and 326; MEC major; U4 standing
Corequisites: MEC 410 and 411


Educational objectives:
1. To provide the skills and instill the values necessary for success in the engineering profession and/or graduate-level study through rigorous instruction in fundamentals and engineering practice.
2. To acquire the technological skills to practice modern mechanical engineering in today's global marketplace, and to provide the opportunity to develop specialized interests through electives, involvement in research projects, and industrial internships.
3. To provide comprehensive training in design and laboratory practice.
4. To encourage the development of communication and leadership skills while increasing awareness of environmental and ethical responsibilities as a professional engineer.

Program outcomes:
The graduates will demonstrate the following:
1. The ability to apply knowledge of mathematics, science, and engineering to mechanical engineering problems. In particular, a knowledge of chemistry and calculus-based physics with depth in at least one, an ability to apply advanced mathematics through multivariate calculus and differential equations, and a familiarity with statistics and linear algebra.
2. The ability to design and conduct experiments, as well as to analyze and interpret data.
3. An ability to work professionally in both the thermal and mechanical systems areas, including the design and realization of such systems to meet desired needs within realistic constraints such as economic, environment, social, political, ethical, health and safety, manufacturability, and sustainability.
4. An ability to function on multi-disciplinary teams.
5. An ability to identify, formulate, and solve engineering problems.
6. A solid understanding of professional and ethical responsibility.
7. An ability to communicate effectively in written, oral, and visual form.
8. The broad education necessary to understand the impact of engineering solutions in a global and societal context.
9. A recognition of the need for, and the ability to engage in, life-long learning.
10. A knowledge of contemporary issues.
11. The ability to use modern engineering techniques, skills, and computing tools necessary for engineering practice.

Americans with Disabilities Act:
If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact Disability Support Services at (631) 632-6748 or http://studentaffairs.stonybrook.edu/dss/. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information go to the following website: http://www.sunysb.edu/ehs/fire/disabilities.shtml

Statement on Academic Dishonesty:
Academic dishonesty is an extremely serious offense and will not be tolerated in any form. Academic dishonesty in general is the presentation of intellectual work that is not originally yours. Examples include, but are not limited to, copying or plagiarizing class assignments including homework, reports, designs, and other submitted materials; copying or otherwise communicating answers on exams with other students; bringing unapproved aids, either in physical (written) or electronic form to an exam; obtaining copies of an exam prior to its administration, etc. Academic dishonesty violates both the ethical and moral standards of the Engineering profession and all infractions related to academic dishonesty will be prosecuted to the fullest via the CEAS CASA committee. For you, the honest student, academic dishonesty results in lower class curves, hence a depression in your GPA and class standing, while cheapening the degree you earn.
MEC 440-441 in 2008-2009 Academic Year
(Fall 2008 and Spring 2009)

Instructor: Prof. Yu Zhou, 153 Light Engineering, 2-8322, yuzhou@notes.cc.sunysb.edu.
Teaching assistant: Mr. Xionghui Lu, 133 Heavy Engineering, 2-1869, luxionghui@gmail.com.
Machine shop manager: Mr. Lester Orlick, B014 Old Engineering, 2-8384, lorlick@ms.cc.sunysb.edu.
Client coordinator for assistive technology projects: Mr. Thomas Rosati, Premm Learning Center, (631) 567-4901, specialtteaching@aol.com, http://www.specialteaching.com/.

Fall 2008 semester: 09/02 (Tuesday) – 12/23/2008 (Tuesday)
Class time: Tuesday & Thursday, 6:50-8:10pm
Classroom: Javits 109
Day of the first class: 09/02/2008 (Tuesday)
Day of the last class: 12/15/2008 (Correction day, Monday following Thursday schedule)

Spring 2009 semester: 01/26 (Monday) – 05/22/2009 (Friday)
Class time: Tuesday & Thursday, 5:20-6:40pm
Class time: Earth & Space 131
Day of the first class: 01/27/2009 (Tuesday)
Day of the last class: 05/07/2009 (Thursday)

Rules:
1. The design project should be a team work. Each design team should consist of 2-3 people based on the nature of the chosen project, with 3 people highly suggested. No single-person team is allowed.
2. Each team should choose an advisor among the faculty, and maintain a regular meeting with the advisor based on a schedule discussed between the team and advisor.
3. Each team should schedule a meeting with Mr. Lester Orlick to discuss about the feasibility of their project during each stage of project selection, conceptual design and detail design.
4. Each team should meet the instructor once a week to discuss about their progress and get advice based on a pre-determined schedule.

Target dates: The target dates must be obeyed so that no delay is caused in not only your project but also to the whole class. The submissions must be made by 5pm on the target dates.
1. Teaming: 09/09/2008 (Tuesday) (If you cannot find a team to join by the deadline, the instructor will assign you a team, and you will have no choice.)
2. Project proposal (project selection, budget): 09/18/2008 (Thursday)
3. Progress report 1 (market and user needs analysis, PDS): 10/09/2008 (Thursday)
4. Progress report 2 (conceptual design): 11/06/2008 (Thursday)
5. Progress report 3 (detail design): 12/09/2008 (Thursday)
6. Presentation 1: 12/11/2008 (Thursday) and/or 12/15/2008 (Tuesday)
7. Demonstration 1 (first prototype): 03/24/2009 (Tuesday)
8. Progress report 4 (first prototype): 03/24/2009 (Tuesday)
9. Demonstration 2 (final prototype): 05/05/2009 (Tuesday) and/or 05/07/2009 (Thursday)
10. Presentation 2: 05/05/2009 (Tuesday) and/or 05/07/2009 (Thursday)
11. Final report: 05/07/2009 (Thursday)

Grading: The letter grade will be issued at the end of the spring semester. Each team has 100 points. A(100-94), A-(93-90), B+(89-87), B(86-82), B-(81-79), C+(78-76), C(75-72), C-(71-68), D+(67-64), D(63-60), F(59 or below). The following is the breakdown.
1. Teaming: 3 pts
2. Project proposal: 3 pts
3. Progress report 1: 8 pts
4. Progress report 2: 8 pts  
5. Progress report 3: 10 pts  
6. Presentation 1: 5 pts  
7. First prototype: 20 pts  
8. Progress report 4: 8 pts  
9. Final prototype: 10 pts  
10. Presentation 2: 5 pts  
11. Final report: 10 pts  
12. Machine shop discussion: 6 pts  
13. Attendance of guest lecture: 4 pts

- Each report will be submitted and graded on a team basis.  
- Each report must be submitted to the instructor as a word file through the digital dropbox on the Blackboard.  
- Late submission of your report will cost 1 point per calendar day.  
- Late demonstration of your prototype will cost 1 point per calendar day.  
- The grade for each student will be adjusted on the basis of his/her team score according to his/her contribution to the project.  
- The final report of each semester (progress report 3 for the fall semester and the final report for the spring semester) will be graded by both the instructor and the project advisor. The two grades will be averaged for the final report. It is your responsibility to make sure that you submit your final report to your project advisor by the deadline.  
- Bonus points: People are encouraged to attend public events. Every year the URECA event is around 04/20. If you attend the URECA post session, you will get 2 pts. On the same day there will be the CEAS senior design competition. Each department will pick 2 teams to compete. The choice has to be made one week before the competition. If you can finish your final prototype by the deadline of department selection, you will be considered as a candidate and get 5 pts. If you win an award in CEAS competition or any external, national competition within the course period, you will get another 5 pts.

**Project budget and reimbursement policy:**

1. The budget of each project (team) should be less than or equal to $230×No. of members.  
2. The reimbursement of project related purchase covers only materials and components.  
3. Reimbursement can be requested at any time during the design and prototyping process.  
4. **The last day of requesting reimbursement will be 05/15/2009.**  
5. To request a reimbursement, you need to fill up a purchase form (get it from the department office LE113), attach original receipts (if paid by a credit card, attach the credit card statement), let the instructor sign it, and submit it to the department office.  
6. **Sales tax will not be reimbursed.**