MEC 440-441 Mechanical Engineering Design I & II
(Fall 2012 and Spring 2013)

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<th>MEC440</th>
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<td>Prerequisites:</td>
<td>MEC 300, 310, 317, 320, 325/125; MEC major; U4 standing</td>
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<td>Co-requisites:</td>
<td>MEC 410 and 411</td>
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Textbook: No textbook is required.

Course sequence 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,
7) 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 a project proposal after choosing the project, progress report for each of the above-listed design phases, and a final project 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.

Course topics
1. MEC440
   1) Forming design teams
   2) Developing design proposals
   3) Project management
   4) Market and user needs analysis
   5) Development of Product Design Specifications
   6) Conceptual design
   7) Preliminary detail design
   8) Writing technical reports
   9) Project presentations
2. MEC441
   1) Detail design
   2) Prototyping
   3) Testing
   4) Writing technical reports
   5) Project presentations and demonstrations

Course learning objectives
1. MEC440
   1) Form a design team and identify a mechanical engineering problem as the design project.
   2) Gain a better appreciation of how engineering solutions can have impact on the society and people’s lives.
   3) Define individual professional responsibility for the project.
   4) Learn contemporary issues related to the project through background search.
   5) Identify the desired needs and multiple realistic constraints.
   6) Generate and evaluate conceptual designs according to PDS.
   7) Conduct detail design and analysis incorporating engineering standards and manufacturing constraints.
   8) Learn things that have not been taught in the classroom but are required for the project.
   9) Prepare design reports and give oral presentations with visualized materials.
2. MEC441
   1) Conduct detail design and analysis incorporating engineering standards and manufacturing constraints.
2) Identify and acquire new knowledge/information that are required for the project but not taught in classroom.
3) Use modern engineering tools to implement the project.
4) Conduct experiments and analyze the data based on the requirements of the specific project.
5) Gain a better appreciation of how engineering solutions can have impact on the society and people’s lives.
6) Prepare design reports and give oral presentations with visualized materials.
7) Develop an ability to function on multidisciplinary teams.

Team Rules
1) The design project should be a team work. Each design team should consist of 2-4 people based on the need of the chosen project. No single-person team is allowed.
2) Each team must choose an advisor among the faculty, and maintain a weekly meeting with the advisor based on a schedule discussed between the team and advisor.
3) Each team must schedule one meeting with the machinists in each design phase, including project selection, conceptual design and detail design, to discuss about the feasibility of their project, and work under the machinists’ advice during the phase of prototyping.

Due dates
The due dates of progress reports must be obeyed so that no delay is caused in not only your project but also to the whole class. The submission must be made by the midnight on each due date with the appropriate electronic files uploaded to the Blackboard, Word for reports and Powerpoint for presentations.

1. Fall semester
   1) Teaming information: 09/14/2012 (Friday) (You must find a team and decide the project topic by then.)
   2) Project proposal: 09/21/2012 (Friday)
   3) Progress report 1 (market/user needs analysis, initial PDS): 10/12/2012 (Friday)
   4) Progress report 2 (conceptual design): 11/09/2012 (Friday)
   5) Semester report (updated market/user needs analysis + updated conceptual design + preliminary detail design): 12/07/2012 (Friday)

2. Spring semester
   1) Progress report 3 (complete detail design): TBD
   2) Progress report 4 (prototyping): TBD
   3) Final project report (updated market/user needs analysis + updated conceptual design + updated detail design + updated prototyping + testing): TBD

Grading
The letter grade will be issued at the end of the spring semester. The fall and spring semesters will have the same grade. 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. Reports 55%
   1) Project proposal 3%
   2) Progress report 1 (market/user needs analysis) 5%
3) Progress report 2 (conceptual design) 5%
4) Semester report (updated market/user needs analysis + updated conceptual design + preliminary detail design) 12%
5) Progress report 3 (complete detail design) 5%
6) Progress report 4 (prototyping) 5%
7) Final project report (updated market/user needs analysis + updated conceptual design + updated detail design + updated prototyping + testing) 20%

2. Presentations 8%
   1) Semester presentation 4%
   2) Final presentation 4%
3. Final prototype 30%
4. Participation in URECA 2%
5. Class attendance (class presentations and guest lectures) 5%

- In order to get a valid grade, a working prototype must be finished. If the prototype is not finished, no grade will be given to the team. If your project is under external funding, you should be responsible to the project requirements.
- Each report will be submitted and graded on a team basis. Late submission of your report will cost 5% of that report per calendar day, and will not be accepted with a delay of 3 or more days.
- The grade for each student will be adjusted on the basis of his/her team score according to his/her contribution to the project. If any member misses 1/3 of project team activities (according to teammates), no grade will be given to him/her. If this happens in the first semester, he/she is no qualified for Mec441.
- The semester report and final report will be graded by both the instructor and the project advisor. The two grades will be averaged for these reports. It is your responsibility to make sure that you submit these reports to your project advisor by the deadline.
- Your attendance of class presentations and guest lectures will be counted towards your final grade. If you miss 1/3 of them, your 5% class attendance points will be completely lost.
- Bonus points: Your grade will be moved up 5%, if within the course period (1) the project wins any nation-wide or international competition, or (2) you publish a paper based on your project (submit a publishable manuscript with the instructor and advisors).

**Project budget and reimbursement policy**

1) The budget limit for each team is ≤ $170 \times \text{Number 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 05/15/2013.
5) To request a reimbursement, you need to fill up a purchase requisition form, attach the original receipts (if paid by a credit card, also attach the credit card statement), let the instructor sign it, and submit it to the department office.
6) Sales tax cannot be reimbursed.
7) For assistive technology projects, we have extra funding to support, but that is only for this category of projects, not for other subjects.
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, ECC (Educational Communications Center) Building, room 128, (631) 632-6748. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Students requiring emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information, go to the following web site http://www.ehs.sunysb.edu/fire/disabilities/asp.

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.