

**MEC 440-441 Mechanical Engineering Design I & II**  
(Fall 2016 and Spring 2017)

**Instructors:**

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(Senior Design Lab)

**Machine shop contact:**

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**Classroom (s):**

100 Frey Hall  
Senior Design Lab 202A

**Fall Class Meetings:**

Mondays and Wednesdays  
8:30AM – 9:50AM

	<b>MEC440</b>	<b>MEC441</b>
<b>Prerequisites:</b>	MEC 300, 310, 317, 320, 325/125; MEC major; U4 standing	MEC440
<b>Co-requisites:</b>	MEC 410 and 411	

**Textbook:** No textbook is required.

**Reference book:** Stuart Pugh, *Total Design — Integrated Methods for Successful Product Design*, Addison Wesley, 1991.

### **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
- 8) Final prototype presentation
- 9) Final project documentation

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) Design Review
  - 3) Prototyping
  - 4) Testing
  - 5) Writing technical reports
  - 6) Project presentations and demonstrations

### **Course learning objectives**

1. MEC440
  - 1) Form a design team and identify a mechanical engineering problem with real-world constraints as a year-long design project.
  - 2) Present project research on how engineering solutions can have impact on the society and people's lives.
  - 3) Define and delineate individual professional responsibility for each team member.
  - 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) Acquire independently information and knowledge specific for the project.
  - 9) Prepare design reports and give effective oral presentations.
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 3-4 people based on the need of the chosen project. No single-person team is allowed. Any team who wish to have a 5 members must obtain explicit approval from the instructors.*

- 2) ***Each team must choose an advisor among the faculty, and maintain regular meetings with the advisor*** based on a schedule discussed between the team and advisor.
- 3) ***Each team must schedule meetings with the machinist in the detail design phase to deal with manufacturability issues.***

## 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

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- 1) Project Proposal Accepted
- 2) Progress report 1 (market/user needs analysis) 10%
- 3) Progress report 2 (conceptual design) 10%
- 4) First Semester report (updated market/user needs analysis + updated conceptual design + preliminary detail design) 15%
- 5) Fall Semester Presentation 5%

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- 6) Progress report 3 (design review) 10%
- 7) Quality of Prototype 15%
- 8) Spring Final Report 20%
- 9) Fall Semester Presentation 5%
- 10) Class attendance (class lectures, presentations and small group meetings) 10%

- In order to get a valid grade, ***a working prototype must be finished*** by the end of the spring semester. 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. Team members will have clear delineation of tasks as part of their documentation. Work that is not submitted by assigned deadlines will be reflected in a reduction of the team grade with additional reductions possible for work not completed by an individual team member who was responsible for that phase of the work. ***If any member misses 1/3 of project team activities as documented by their teammates, no grade will be given to him/her. If this happens in the first semester, he/she cannot continue on with MEC441.***

- The semester report and final report will be graded by both of the instructors and the project advisor. These grades will be used to calculate semester grades. It is your responsibility to make sure that you submit these reports to your instructors and your project advisor by the deadline.
- Your attendance of class presentations, small group sessions, and guest lectures is a part of your final grade. *If you miss 1/3 of them, you will not be credited for class participation.*

### **Project budget and reimbursement policy**

- 1) *The budget limit for each student is about \$280.*
- 2) The reimbursement of project related purchase covers only materials and components.
- 3) Reimbursement can be requested at any time after the design review has taken place.
- 4) The last day of requesting reimbursement will be two weeks before the end of the spring semester.
- 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) *There is additional funding that is available for assistive technology projects, through University and NSF grant funding for these projects.*

### **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.