

MEC 440-441 Mechanical Engineering Design I & II

(Fall 2019 and Spring 2020)

Document Date: August 26, 2019

Contact Information and Times For MEC 440 Fall 2019

Instructors:

Professor Jahangir Rastegar

Section 02

Fall Classroom: Melville Library
E4320

Mon & Wed 8:30 AM– 9:50 AM

Office: 108 Heavy Engineering

Office Hours: MW 10:00AM–12:00PM
and per small group schedule

631-632-8314

Jahangir.Rastegar@stonybrook.edu

Professor Jay Mendelson

Section 01

Fall Classroom: Melville Library
W4540

Mon & Wed 8:30AM – 9:50AM

Office: 153 Light Engineering

Office Hours: MW 10:15AM-11:45AM
and per small group schedule

Jay.Mendelson@stonybrook.edu

Mr. Rafael Tejada

Mechanical Laboratory Specialist

Office: 152 Heavy Engineering

rafael.tejada@stonybrook.edu

Machine shop contact:

Mr. Joseph Schurz

Office: B014 Old Engineering

631-632-8384

	MEC440	MEC441
Prerequisites:	MEC 225, 300, 310, 317, 320, 325; MEC major; U4 standing	MEC440
Co-requisites:	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) and product design criteria (PDC) development
- 4) Develop design concepts
- 5) Review and select/develop a concept for prototyping
- 6) Detail design
- 7) Prototyping
- 8) Testing
- 9) Final prototype presentation
- 10) Final project report

The design process spans two semesters. The first semester will emphasize design concept development and detail design (which includes analytical modeling, analysis, development of solid models, assembly instructions, etc.). By the end of the first semester, each team should generate a complete set of design details of the project, so that it is ready for fabrication. During the detail design process, the design must be cleared for manufacturability, considering the available manufacturing capabilities at the college. The second semester will emphasize the fabrication and testing of the prototype. Students will fabricate and refine their prototypes, based on the test results.

To fulfill the course requirement, each design team must submit a project proposal and five progress reports. At the end of the first semester, each team must give an oral presentation of their design steps and results. At the end of the second semester, each team must give an oral presentation of the product implementation process, and demonstrate a working prototype.

Course learning objectives

A. MEC440

- 1) Synthesize engineering knowledge to identify a problem and plan tasks of a mechanical engineering solution to the problem within a team environment.
- 2) Consider market and public welfare issues in PDS as relevant to individuals and the broader society.
- 3) Develop design specifications (PDS) and Product Design Criteria (PDC) according to identified needs and constraints.
- 4) Generate and evaluate conceptual designs per the PDS and PDC
- 5) Conduct detail design and analysis incorporating engineering standards and manufacturing constraints
- 6) Accept individual professional responsibility for the project.
- 7) Prepare three design reports and give oral presentations with visual materials.

B. MEC441

- 1) Build and refine a working prototype that meets the PDS and PDC based on a detailed testing protocol.
- 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) Gain a better appreciation of how engineering solutions can have impact on the society and people's lives.
- 5) Prepare two design reports and give oral presentations with visualized materials.
- 6) Develop an ability to function on a multidisciplinary team.

Team Rules

- 1) The design project should be worked on as a team of 3-4 people, based on the needs of the chosen project. No single person teams are allowed. A two-mechanical engineering team is allowed only when it is part of a four-person collaborative team with another engineering department.
- 2) You may choose a project advisor from the ME department faculty, if the requested professor agrees to your request. Otherwise, the ME department will provide an advisor for you. In either case, you must maintain regular meetings with your advisor on a mutually agreeable schedule.
- 3) If you are not part of a team of appropriate size, your professor will select your teammates.
- 4) Each team must schedule meetings with Rafael Tejada in the detail design phase and prototype phases to review manufacturability issues.

Grading

- The letter grade will be issued at the end of the spring semester and count for 6 credits.
- Each team will have an aggregate score of up to 100 points.

- Letter grades are given as follows: A(96-100), A-(91-95.9), B+(87-90.9), B(82-86.9), B-(78-81.9), C+(74-77.9), C(70-73.9), C-(67-69.9), D+(64-66.9), D(60-63.9), F(59.9 or below).

1. Reports

MEC 440

- 1) Project Proposal due 09/1/2019
- 2) Project Proposal Approved, start project: 09/9/2019
- 3) Project Advisor Selected 09/23/2019
- 4) Progress report 1 (market/user needs analysis) due 09/27/19 10%
- 5) Progress report 2 (conceptual design) due 11/1/19 10%
- 6) Updated conceptual design due 11/22/19
- 7) Progress report 3 (updated conceptual design + detail design) due 12/19/19 15%
- 8) Fall Semester Presentation 02/03/20 and 02/05/20 5%
- 9) Class attendance and team effort (class lectures, presentations and small group meetings) 5%

MEC 441

- 10) Progress report 4 (First working prototype) due 03/13/20 10%
- 11) First Product testing per PDC and PDS due 04/10/19
- 12) Progress report 5 (Final working prototype and design) due 05/15/20 35%
- 13) Spring Semester Presentation approximately 05/13/2020 5%
- 14) Class attendance and team effort (class lectures, presentations and small group meetings) 5%

General Class Grading Rules

- Each report will be submitted and graded on a team basis. Late submission of your report will cost 5% of that report per day. Reports will not be accepted after they are 3 days late.
- It is our goal to give the same grade for each member for a successful team. However, the grade for each student may be adjusted according to his/her contribution to the project.
- Your attendance of class presentations and small group meetings will be counted towards your grade. If you miss 1/3 or more of them, you will lose your class attendance and teamwork points (5% for each of fall semester and spring semester).
- Any team that does not have an academic advisor will lose their class attendance and teamwork points.
- Students are expected to clean up after themselves in the senior design lab and machine shop with regards to all parts and tools that they use and in terms of cleaning up waste material. They must also follow all lab and university policies with regards to avoiding the use of food and beverages in laboratories. Students must return all keys to the lab to the mechanical engineering department staff. Confer with Mr. Rafael Tejada for further

explanation. Any student in violation of these policies may be subject to discipline including reductions in grades.

- Your attendance and participation at the URECA campus-wide undergraduate research symposium held each April is mandatory. You are expected to help your group prepare a poster and take turns explaining your work to all visitors to your area. If you miss the URECA symposium, you will be penalized 3% from your aggregate score for the class, which translates to roughly 1/3 of a letter grade.

Fall Semester Grading Rules

- Student groups must submit their choice from the project list by 09/1/19. Up to two groups will be allowed to work on one project. Choices are solidified by 09/9/19. The class professors will decide which groups will work on a project, when too many groups select the same one.
- Students that wish to work on their own project idea must receive approval from their class professor. Their project proposal must come with a complete set of product design criteria, as illustrated in the project list.
- A zero grade will be given on report 1 for groups that do not have an approved project by the 09/9/2019. Then your class professor will assign you a project.
- Final designs with fully dimensioned drawings and BOMs are required in report 3. Groups that do not have a coherent final design will not be allowed to continue onwards to MEC441 in spring semester.

Spring Semester Grading Rules

- In order to get a grade for report 5, a working prototype must be finished. No grade will be given for an incomplete prototype.
- Prototype work should start at the beginning of the spring semester, leaving sufficient time to refine and improve the design
- The fifth report will be graded by the instructors and the project advisor. It is your responsibility to make sure that you submit these reports to your project advisor by the deadline.

Project budget and reimbursement policy

- 1) ***The budget limit per student is \$280.***
- 2) The reimbursement of project related purchase covers only materials and components.
- 3) Travel expenses are not reimbursable.
- 4) Detailed instructions and policy statements are shown in the document “Senior Design Reimbursement Packet 2019-20.pdf”, which will be loaded into Blackboard.
- 5) ***Additional funding is available for assistive technology projects, through University and NSF grant funding for these projects.***

Usage of Blackboard

Students are required to use Blackboard, where important announcements, slides, homework, assignments, and supplementary materials of the course are posted. We will be using the automatic grading capability of Blackboard to grade homework and projects. Anti-plagiarism software will be used to guarantee that all students do their own work in accordance to Stony Brook policies as stated in the section below on **ACADEMIC INTEGRITY**.

<http://blackboard.stonybrook.edu>

Use your NetID and password to login. You can also call the Blackboard Support Team at: 631-632-2777 or e-mail: blackboard@stonybrook.edu for further information.

Important Copyright Notice: The materials in this course available online through Blackboard or other online channels are for the exclusive use of registered students currently enrolled in this course, and may not be retained or further distributed. In addition to legal sanctions, violation of these copyright prohibitions may result in University disciplinary action.

Various University Policies and Statements

DISABILITY SUPPORT SERVICES (DSS) STATEMENT: If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Student Accessibility Support Center, ECC (Educational Communications Center) Building, room128, (631) 632-6748. They will determine with you what accommodations, if any, 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.stonybrook.edu/ehs/fire/disabilities>

ACADEMIC INTEGRITY STATEMENT: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

CRITICAL INCIDENT MANAGEMENT: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of University Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.