

**MEC 440-441 Mechanical Engineering Design I & II**

(Fall 2020 and Spring 2021)

Date: January 30, 2020

**Contact Information and Times For MEC 440 Fall 2020**

**Instructors:**

**Professor Jeff Ge**

Section 02

Spring Classroom: Will hold online meetings with student groups via Zoom

Mon & Wed 8:30 AM– 9:50 AM

Office: 113 Light Engineering

Office Hours: by appointment

[qiaode.ge@stonybrook.edu](mailto:qiaode.ge@stonybrook.edu)

**Professor Jay Mendelson**

Section 01

Spring Classroom: Will hold online meetings with student groups via Zoom

Mon & Wed 8:30AM – 9:50AM

Office: 153 Light Engineering

Office Hours: by appointment

[Jay.Mendelson@stonybrook.edu](mailto:Jay.Mendelson@stonybrook.edu)

**Machine shop contact:**

**Mr. Joseph Schurz**

Office: B014 Old Engineering

631-632-8384

	<b>MEC440</b>	<b>MEC441</b>
<b>Prerequisites:</b>	MEC 225, 300, 310, 317, 320, 325; 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.

We will have online instruction from the two faculty members for Fall 2020 Semester, with students having access to the machine shop and student lab with appropriate social distance guidelines. Once the university announces its instruction policy for the Spring 2021 semester, we will create the appropriate instructional strategy for that semester.

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 fall 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 fall 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 spring 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 fall semester, each team must give an oral presentation of their design steps and results. At the end of the spring 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) Define intellectual property (e.g. copyright, trade secrets, patents)
- 4) Develop design specifications (PDS) according to identified needs and constraints of the product requirements
- 5) Generate and evaluate conceptual designs per the PDS
- 6) Conduct detail design and analysis incorporating engineering standards and manufacturing constraints
- 7) Accept individual professional responsibility for the project.
- 8) 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 product requirements 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) Prepare two design reports and give oral presentations with visualized materials.
- 5) 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 class professor will select teammates for you.
- 4) Each team must schedule meetings with Professor 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 08/28/2020
- 2) Project Proposal Approved, start project: 09/7/2020
- 3) Project Advisor Selected 09/21/2020
- 4) Progress report 1 (market/user needs analysis) due 09/25/20 10%
- 5) Progress report 2 (conceptual design) due 10/30/20 10%
- 6) Updated conceptual design due 11/20/20 (review at group meetings with class professor)
- 7) Progress report 3 (updated conceptual design + detail design) due 12/18/20 15%
- 8) Fall Semester Presentation 02/08/21 and 02/10/21 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 03/12/21 10%
- 11) First Product testing per PDC and PDS due 04/10/21 (review at group meetings with class professor)
- 12) Progress report 5 (Final working prototype) due 05/14/21 35%
- 13) Spring Semester Presentation: 05/18/21 8:00- 10:45AM 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 Professor 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. This year's symposium will be in May 2021.

### **Fall Semester Grading Rules**

- Student groups must submit their choice from the project list by 08/30/20. Up to two groups will be allowed to work on one project. Choices are solidified by 09/7/20. 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 09/7/2020. Then your class professor will assign you a project.
- Final designs with fully dimensioned drawings and BOM's are required in report 3. Groups that do not have a coherent final design may 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 by the time the fourth report is submitted.

### **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) Sales tax and shipping costs can be reimbursed.
- 4) Travel expense cannot be reimbursed.
- 5) Detailed instructions and policy statements are shown in the document "Senior Design Reimbursement Packet 2020-21.pdf", which will be loaded into Blackboard.

### **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 Stonybrook 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](mailto:blackboard@stonybrook.edu) for further information.

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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. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. 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](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.

**CLASS ATTENDANCE SCHEDULE:** Students are expected to attend every class, report for examinations and submit major graded coursework as scheduled. If a student is unable to attend lecture(s), report for any exams or complete major graded coursework as scheduled due to extenuating circumstances, the student must contact the instructor as soon as possible. Students may be requested to provide documentation to support their absence and/or may be referred to the Student Support Team for assistance. Students will be provided reasonable accommodations for missed exams, assignments or projects due to significant illness, tragedy or other personal emergencies. In the instance of missed small group meetings, the student is responsible for communicating with teammates in the group on the major findings of the meeting and actions for the group. Please note, all students must follow Stony Brook, local, state and Centers for Disease Control and Prevention (CDC) guidelines to reduce the risk of transmission of COVID. For questions or more information click [here](#).