ENG ME 460 - Senior Design I
Fall 2024 Syllabus

Version 2 – 2024.08.27

Instructors:

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Prof. Enrique Gutierrez-Wing
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Graduate Student Teacher(s):

TBD

Class Meeting Rooms and Times:

M/W	10:10 AM – 11:55 PM	ENG 302	Section A1	Linn
M/W	12:20 PM – 02:05 PM	EPC 206	Section A2	Linn
Tu/Th	01:30 PM – 03:15 PM	ENG 302	Section A3	Bunch
M/W	10:10 AM – 11:55 PM	FLR 121	Section A4	DiBella
M/W	12:20 PM – 02:05 PM	ENG 302	Section A5	Gutierrez-Wing
Tu/Th	01:30 PM – 03:15 PM	PHO 201	Section A6	Geiger
M/W	06:30 PM – 08:15 PM	PHO 210	Section A7	Linn

Note: These meeting rooms and times are reserved for the semester and are available for teams to meet with their instructor in-person. However, teams may choose to meet with their instructor remotely on other days and times. Each team needs to arrange for a regular weekly meeting of at least 30 minutes at a time that is convenient for all team members and their instructor.

Course Website:

Blackboard Learn. The website contains a common folder with information applicable to all sections and separate folders for information that professors may create for their individual sections.

Catalog Course Description:

The course develops skills that are crucial to the successful completion of the Senior Capstone Design project. The core technical framework is electro-mechanical systems. Through lectures, workshops, and online materials, students gain practical experience in component and system design, project planning, and engineering communications. The course guides students through execution and documentation of the conceptual design stage of their Capstone projects. Cannot be taken for credit in addition to ENG ME 560. When taken with ENG ME 461, this course fulfills a single unit in the following BU Hub areas: Digital/Multimedia Expression, Oral and/or Signed Communication, Writing-Intensive Course, Research and Information Literacy.
(4 cr., 1st sem.)

Hub Learning Outcomes:

Because of the intensely collaborative nature of senior projects, students are expected to complete ME460 and ME461 within the same team and within one academic year. As an outcome of successful completion of this course sequence, students will be able to craft responsible, considered, and well-structured arguments in writing, through oral or signed communication, and the use of graphic and electronic media. They will understand the capabilities of various media and be able to apply them with discernment to the occasion at hand. Moreover, as a result of being coached through the execution of an extended engineering project, they will gain transferrable skills in research and information literacy by using standard research and problem-solving tools and techniques of the engineering discipline.

When both ME460 and ME461 are completed, these courses together will satisfy the following BU Hub areas:

Writing-Intensive Course #2	1 unit
Oral and/or Signed Communication	1 unit
Digital/Multimedia Expression	1 unit
Research and Information Literacy	1 unit

Prerequisites:

CASWR 151	Writing, Research, & Inquiry with Oral and/or Signed Expression
CASWR 152	Writing, Research, & Inquiry with Digital/Multimedia Expression
CASWR 153	Writing, Research, & Inquiry with Creativity/Innovation
ME 302	Engineering Mechanics II
ME 305	Mechanics of Materials
ME 360	Electromechanical Design
*ME 408	Aircraft Performance and Design

*Students who wish to work on an aircraft design related capstone project, including AIAA or NASA competition projects and Design, Build and Fly (DBF) projects, must have completed or be concurrently enrolled in ME 408. ME 408 is not required for general aerospace and aerodynamics capstone projects.

Course Outcomes:

Students successfully completing ME 460 will have:

1. Gained appreciation for the breadth of knowledge, skills, and effort required to solve complex engineering problems within technical, economic, and societal constraints.
2. Through coached practice, learned transferrable research skills for solving problems and troubleshooting systems by decomposing them into related parts and methodically working through a hierarchy of probable causes and corrections.
3. Applied engineering principles and methods to the design, selection and integration of electro-mechanical system components.
4. Identified and documented appropriate background material: benchmarks of similar problems and solutions, citations of publicly available information, interviews with experts, and summaries of private communications.
5. Applied analysis tools, common in engineering, to the design of productive investigations and the selection of efficient research paths for the solution of problems. Examples include Functional Decomposition, Function and Means Charts, Decision Matrices, Ishikawa Diagrams, and the Shewert Cycle (Plan-Do-Measure-Adjust).
6. Established the stages and activities of a design project, identified research objectives and unambiguously visible development milestones, and made informed estimations of the required resources.
7. Identified unambiguously visible milestones to gage the progress of the work.

8. Developed skills required to communicate effectively with a variety of constituencies, technical and non-technical, in a variety of scenarios associated with a design project.
9. Developed effective means for collaboration in a team whose members represent diverse skills and perspectives.
10. Documented the conceptual design stage of the Senior Capstone design project, including the background material listed as item 4.
11. Established the platform for rapid progress toward the completion of the Senior Design Project in the second semester.

Senior capstone projects:

Each student should have a project and team assigned prior to the first class. If this is not the case, then see one of the course instructors as soon as possible to get assigned to a project and team.

Course Calendar:

See file "Calendar-ME460-F24" for important assignments and dates.

Ethics Exercises:

There are two (2) Ethics Exercises that have pre-work followed by in-class exercises. These exercises are mandatory and worth 10% of your final grade.

Resume Assignment, Application to your team:

You will be required to write your own resume. This will be used to apply to your team. Your resume may also be made available to prospective sponsors who would like to see the qualifications of the teams that they would like to sponsor. This is an individual assignment. See assignment dates above.

Peer and Team Self-Assessment:

You and your teammates will be required to provide a peer review of you team members. You will be assigned this task at mid-term and at the end of the semester. Detailed peer review instructions will be provided before this task is assigned. The peer review can affect the team portion of your grade, either raise, lower or no effect depending upon your score.

File Storage Drive Organization:

Your team will be provided with a File Storage Drive where ALL files to be evaluated by your instructor must be placed. The drive will be preorganized and include templates for reports and rubrics as applicable. It is extremely important that the File Storage Drive be kept up to date with your work.

If we can't find your work, then you can't get a grade.

Books and Other Printed References:

Some in-class exercises will require the availability of a laptop computer or tablet. At least one member of each team should have access to such a device when meeting as a team for exercises. The following texts are useful references. Each team should have at least one copy of #1, which is the main text for the course.

1. ***David G. Ullman,*** **The Mechanical Design Process – with Case Studies, 6th Edition, 2018, ISBN 9780470225967.**

2. *Robert C. Juvinall, Kurt M. Marshek,* Fundamentals of Machine Component Design, John Wiley and Sons, ISBN-13: 978-1-5178-1582-0

3. *Andre Sharon*, Machine Design and Control – A Systems Level Approach, Custom Printing, John Wiley and Sons, any edition

4. Machinery's Handbook, 29th ed., Industrial Press, 2012, ISBN 9780831129002, Any recent edition is useful. Check for online availability.
5. *Edward R. Tufte*, The Visual Display of Quantitative Information, 2nd ed., ISBN 978-0961392147. The classic treatise on "how to communicate information through the simultaneous presentation of words, numbers, and pictures."

Courseware:

Course reading material and assignments will be distributed online through Blackboard Learn.

Grading:

Progress Reports / Design Reviews	30%
Ethics Exercises	10%
Final Oral Presentation	10%
Final Written Report	30%
Teamwork and class participation (individual), Peer Review, Google Drive (Design Record)	20%
TOTAL:	**100%**

Resources:

- Abstracts of final reports, as well as video recordings of final presentations for the past several years, are available at the department website. They are indexed at the course website.
- Graduate Student Teachers will be available to support teams in mechanics, Matlab and Arduino programming environments, and use of CAD tools.
- We anticipate being able to assign each team its own project-storage locker space.

Academic Behavior Standards:

Your behavior in this course is bound by the Boston University Academic Conduct Code found at the website http://www.bu.edu/academics/academic-conduct-code. You are responsible for understanding the requirements of this code. If you are in doubt about whether any contemplated action in the course would violate the code, ask your instructor before doing it. Since this course has few objective exams, opportunities for cheating are reduced, but any work presented as your own must in fact be your own, and any work quoted or otherwise reused from others must be explicitly acknowledged. The source of images included in reports or presentations must be referenced.

Attendance and Team Contribution:

The primary metric of responsible attendance will be the student's degree of contribution to the team. Members are expected to inform their peers in a timely manner if unavoidable circumstances prevent their participation in scheduled team meetings. Team assignments will require all students to identify their unique contribution. Students will receive no credit for in-class exercises for which they are not present. Non-contribution to the team's progress will result in a failing grade for a given assignment, and sustained non-contribution, after warning, will result in a failing grade in the course.

While success of the capstone project relies heavily on the coherent effort of the team, the course requires evidence of contribution from each individual. Due dates for individual assignments, or identified individual contributions in team-produced documents, are indicated in the course calendar.