ENG ME 461 - Senior Design II
Spring 2025 Syllabus

Version 1 – 1/10/2025

Instructors:

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Office hours by appointment

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Prof. Enrique Gutierrez-Wing
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Office hours by appointment

Graduate Student Teacher(s):

None.

Class Meeting Rooms and Times:

Section	Instructor	Day	Time	Room
A1	Linn	Mon/Wed	10:10 AM to 11:55 AM	EPC 206
A2	Linn	Tue/Thu	09:00 AM to 10:45 AM	PHO 201
A3	Bunch	Mon/Wed	08:00 AM to 09:45 AM	EPC 206
A4	DiBella	Tue/Thu	06:30 PM to 08:15 PM	PHO 201
A5	Gutierrez-Wing	Mon/Wed	02:30 PM to 04:15 PM	BRB 122
A6	Geiger	Tue/Thu	01:30 PM to 03:15 PM	EPC 206
A7	Linn	Mon/Wed	04:30 PM to 06:15 PM	CDS 263

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 460, 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 credits, 2cnd semester)

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
ME 460	Senior Design I (for ME 461)

*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 461 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 of ME 460. 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-ME461-S25" for important assignments and dates.

Ethics Assignment:

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. The Ethics exercises were completed in ME 460. There is a mandatory Ethics element that must be applied to your project. More details on this in the final written report template.

Resume:

There will be a special topics lecture on best practices relating to resume writing by the Career Development Office (CDO). Details as to when and where of the lecture will be forthcoming.

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 (Dropbox) 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 (Dropbox) 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.

Course Grading:

Progress Reports / Design Reviews	25%
Final Oral Presentation and Written Report	25%
Project Effort-Outcome Score (see below)	30%
Teamwork and class participation (individual), Peer Review, Google Drive (Design Record)	20%
TOTAL:	**100%**

Project Effort-Outcome Score.

The Project Effort-Outcome score is intended to measure the effort by the team as a whole and the resulting outcome of that effort. There usually is a positive correlation between effort and outcome, but not always. Below, there is an example of how the Project Effort-Outcome Score is calculated. The example below is just that, i.e., an example of a completed Effort-Outcome assessment. Just to clear, in the example below, the 86% score would be applied to the 30% Effort-Outcome grading element that can be seen above in the Course Grading box.

Example Project Effort-Outcome Score	
	Grade
Effort	**83%**
-Preparation - Research/Benchmarking/Expert Consultation	90%
-Creativity - Tool Use/Inspiration/Decisiveness	80%
-Execution - Attentive/Thoroughness/Achievement	95%
-Communication - Team/Advisor/Prosperity	65%
Outcome (Build & Test or Paper)	**90%**
-Product Generation - Building and/or Modeling the Prototype	95%
-Product Evaluation - Testing and /or Optimizing the Prototype	85%
-Product Evaluation - Final Conclusions and Recommendations	90%
-Project Result - Below/Meets/Exceeds Customer Expectations	90%
Total Project Effort-Outcome Score	**86%**

Resources:

Legacy Senior Design Projects. Final written reports and presentations of previous ME 460 / ME 461 classes are available upon request. Work with your advisor to obtain copies.

Graduate Student Teachers (GST's). GST's may be available to support teams in mechanics, Matlab and Arduino programming environments, and use of CAD tools. There is no GST planned for the Spring 2025 semester.

Dedicated Locker Space. Each team may have its own project-storage locker space for project related materials, if required. Contact Professor Linn or Professor Gutierrez-Wing if you need locker space for your project.

Lab Manager. Moriah Lim is the new Lab Manager for our instructional labs and RASTIC.

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.

Participation by all team members at weekly meetings with their advisor is expected. The expectation for the weekly meetings is for team members to come prepared with a meeting agenda including, but not limited to,

-review of open action items for team members and advisor
-questions on technical specifics of the project
-questions on ME 461 process and tools and their application to the project.