

ENGN 379
Washington and Lee University
Capstone Design II
Winter 2020

Course Web Page: https://erickson.academic.wlu.edu/teaching/capstone_w2020/

Course/Instructor Info

Course Meets:	MW 9.45 - 11.45 am, Howe 115
Instructor:	Jon Erickson
Office Hours:	MTW 1.30 - 3.00 pm and by appointment (walk-ins welcome!)
Where to find me:	Howe 221 (office) or Howe 222 (research lab)
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Course Text

Engineering Design: A Project Based Introduction, C Dym, P Little, E Orwin. 4th Edition, 2013. ISBN: 978-1-118-32458-5.

Course Overview and Objectives

This course is the second-half of a year-long capstone design sequence during which you and your team members will continue and complete the systematic engineering process to solve a real-world design problem. The second half of the capstone sequence emphasizes:

1. Iterative development and implementation of a refined design
2. Testing, analysis, and demonstrating proof of concept
3. Communication (written and oral) of design details and rationale, testing procedures and results, merits and limitations, etc which is clear, concise and comprehensive

In brief, this course is the challenging, exciting, and hopefully enjoyable culmination of your engineering education. It will require you to integrate and apply concepts, techniques, and methodology you have learned in previous engineering courses. You will collaborate closely with your project team mates, peers, the instructor, and project mentors. At the conclusion of this course, you will have achieved all of the objectives of the Engineering Program:

- Acquire a working knowledge of foundational engineering principles.
- Apply the foundational principles to engineering problems.
- Integrate foundational principles to develop innovative solutions to novel, open-ended engineering design projects.
- Apply an engineering design process to satisfy requirements and specifications of design projects.
- Understand how engineers operate within the broader context of society.

- Incorporate cultural, environmental, economical, and ethical factors into design decisions.
- Communicate technical knowledge through written documents, oral presentations, and digital and graphical media.
- Learn to communicate effectively within a team environment.
- Gain proficiency with contemporary equipment and software encountered in research environments and professional practice.
- Prepare to enter a diverse work environment including advanced engineering studies or professional practice.

Attendance and How we'll use course meeting time

Attendance: All students are expected to attend every lecture period. In addition, **all students are expected to attend several evening course sessions dedicated for technical design review presentations**; See course calendar for specific dates and times.

Class Usage: This course is likely to be less formally structured with *content* than others you have taken. After all, you and your team and solving an open-ended engineering problem in this course! That said, we will use the Monday and Wednesday course block meeting time for several formal functions including:

1. Team workshop time
2. Individual team meetings/project consultation with the instructor
3. Technical design review presentation
4. Writing workshops emphasizing common technical elements

Grading

Part of your final grade in the course will be based on the merits of success in your final design implementation and well as the quality of final communication pieces. A good design doesn't happen over night. So, weekly progress reports will also factor heavily into your final grade. The numeric grading criteria are:

Progress Reports and Design Logbook	40%
Technical Design Review Presentation	10%
Final Design Implementation	30%
Final Written Report	10%
Final Presentation (open to public)	10%
<hr/> Total	<hr/> 100%

Team Progress Modified: The engineering faculty will meet at semi-regular intervals throughout winter term to evaluate each team's progress on the enumerated goals for a capstone project. Your progress will be documented on a rubric. By the end of the winter term, your team should ideally have achieved 100% completion of these goals. The actual percent complete will serve as the Team Progress Modifier. This numeric score will be averaged with your individual score to compute a final numeric grade. For example, if as an individual you achieved a score of 95% and your team progress modifier was 90%, then your final numeric grade is 92.5%.

Lastly, final letter grades will be based on the above numeric score, but subjective factors such as substantive contributions in class, intellectual growth, independence, etc. will also be considered. In other words, your summative contributions and final state of competence is more important than your overall numerical average. The subjective component is simply a mechanism by which—*when appropriate*—I can translate your final state into an appropriate letter grade.

Design Logbook

Each student must keep an up-to-date design log book. Entries should evidence the engineering thinking process including (but not limited to): design ideas, sketches, relevant literature, related products, manufacturers and part ID numbers, design and build process, testing and analysis methods, test results and conclusions, any other information relevant to your project. Maintaining a logbook is the a critical component and reflection process for to keep track of past, present, and future developments of your project.

Hours must be logged. Remember: as a 4-unit course, **12 hours per week per student of substantive time and energy investment, therefore project progress, is the baseline expected contribution.** Substantive contributions must be evidenced by the design logbook entries.

Notebook entries must be legible and understandable to someone who is knowledgeable about engineering in general (but not necessarily an expert on the subfield/specific aspects of your project).

Design logbooks must be submitted with every progress report.

Progress Reports

A single progress report for each team will be submitted on a weekly basis, typically by 5pm Wednesday; see course schedule for specific due dates.

The progress report must identify:

1. tasks assigned each individual team member
2. progress made on each task
3. challenges encountered and ideas on how to overcome them insomuch as they provide substantive discussion points to begin debugging the problem with the instructor and/or other mentors.

Note that effective team work is strongly encouraged: **Work together; divide and conquer.** To this end, each student will receive a grade based on two components: 1) individual accomplishments; and 2) overall team accomplishments. Full credit will only be awarded when all individuals accomplishes their tasks. If a team member is struggling with their tasks, provide support to help them out, but do not do the job for them. In other words, completing the tasks of others will not benefit anyone's grade.

Technical Design Review

Each team will present a technical design review with the primary audience comprised of the engineering faculty and external project mentors; and peers in the course. See course calendar for specific dates. The goals of the technical design review are for the project team to present the most up to date technical progress; and to receive constructive questions and feedback for future

progress. Each team should expect a well-intentioned “grill-session” to help ensure the success of the project.

Final Design Implementation and Presentation

The final design report and presentation are intended as key communication pieces for your client and/or end-user. The reporting should be clear, concise, and comprehensive. It should distill the important aspects of the overall design; this is in contrast to the “here’s the brain dump of what we did this term.” Carefully consider your audience and focus in the final written report (for your client) and presentation (open to the public). We’ll workshop and do practice presentations during winter term.

COURSE POLICIES

Academic Honesty

According to the White Book¹, the Honor System is the “fundamental principle that a spirit of trust pervades all aspects of student life.” The system is one of “mutual trust” which clearly establishes that “Students should do their own work, *represent themselves truthfully, and claim only that which is their own*” (emphasis added by JE). The system is not designed to “work against or frighten” students, rather it was designed to allow students “unparalleled academic freedom.”

You are expected to abide by the W&L Honor System at all times. Any suspected Honor Violation will be reported to the Executive Committee. In such an event, the instructor reserves the right to assign a grade of zero on that assignment and/or a failing grade for the course. (I believe in my heart that this policy will never ever come into play, but I am, more or less, legally compelled to explicitly state it in the official course syllabus.) Specific policies regarding homework assignments, lab reports, and exams are described in detail below. If you are ever in doubt about whether an action is within bounds, please consult with me first.

Special Academic Accommodations

Washington and Lee University makes reasonable academic accommodations for qualified students with disabilities. All undergraduate accommodations must be approved through the Title IX Coordinator and Director of Disability Resources, Elrod Commons 212, (540) 458-4055. Students requesting accommodations for this course should present an official accommodation letter within the first two weeks of the term and schedule a meeting outside of class time to discuss accommodations. It is the student’s responsibility to present this paperwork in a timely fashion and to follow up about accommodation arrangements. Accommodations for test-taking must be arranged with the professor at least a week before the date of the test or exam, including finals

Attendance Policy

Course Meeting Times

Attendance and full engagement is expected/mandatory during course meeting times. Hopefully, the time together in the classroom and lab/workshop are beneficial to you and worth attending. If you miss class for a legitimate reason (illness, family emergency, etc.) I will make every effort to help you get caught up as soon as possible. You must notify me *before class, in person or by phone*, to explain the circumstances of an excused absence. In the event of an unexcused absence (i.e., “Whoops, I slept in”; “I had paper due for another class”; “I left a day early for Feb Break”, etc.), you are solely responsible for staying up to date with class notes and news (e.g., deviations from the calendar of topics covered, exam procedures, etc.).

Note on Athletics

Sanctioned athletic competitions, but not practice sessions, qualify as an excused absence. Please notify me of an athletic absence well in advance of the athletic event.

¹Full text of White Book available at <http://www.wlu.edu/x48217.xml>

Electronic Devices and Texting



Figure 1: Electronics is a No Texting Zone.

I would like to believe I am a pretty easy-going, congenial guy, but the one thing that absolutely drives me bonkers is texting during class. So, thank you in advance for powering down your cell phone/iPhone/whichever device, and for respecting the strict no-texting policy.

If you must have your phone on for tending to, say, a medical or family emergency, please inform me before the start of class.

Sick Day Policy

If you are feeling ill, please stay home, get some rest, get a friend to bring you notes from class and chicken soup and get better soon! It is in everyone's best interest for you to minimize interpersonal contact when you are feeling sick, especially when you are symptomatic. I trust your judgment and do not require a doctor's note. (However, please remember to contact me regarding this absence).

Suggestions and Feedback

Suggestions for improvement, constructive criticism, and positive feedback are welcome at anytime. Please do not hesitate to approach me with any concerns you may have about this course. I take your feedback very seriously and will sincerely respond to all received comments. It is the main mechanisms by which the course will improve over time (sometimes instantaneously, when possible!).