

ENGR 4010
Multidisciplinary Design and Development I
Fall 2019
Beginning of Course Memo and Syllabus

Class sessions: MWF 10 – 10:50 a.m.
Course credit: 1-3 credits. Most register for 3 credits
Course website: UVA Collab
Course instructor: James Groves
Office hours: See the front page of the course website for up-to-date details

COURSE OVERVIEW

Course description

A collaborative design thinking environment in which students craft solutions to emerging challenges – in areas such as sustainability and health care. The course provides an in-depth design experience reflective of contemporary professional practice. Key attributes include the multidisciplinary composition of design teams, an emphasis on modern practice, problems selected by students, and client-stakeholder engagement. The popular, effective design thinking process is followed. Students select a design space, conceive of a solution, and explore the viability of that solution.

Pre- or co-requisite courses or topics

The courses are intended for 3rd and 4th year undergraduates at the University of Virginia. Students in all majors across the university are encouraged to enroll.

A description of this year's course section

This two-semester design course sequence is intended to serve as an opportunity for students to draw together their college studies and apply them deliberately towards the design, development, and preparation for market of a solution to a societal challenge. The courses guide student design, development, and market preparation efforts by means of the design thinking process (Figure 1). That framework will be used as a guide for both team-based work and professional project management efforts (in the areas of design, development, and market preparation) throughout the semester.

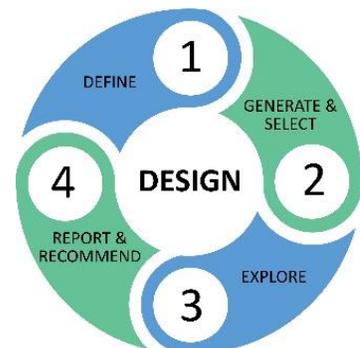


Fig. 1: The design thinking process

At the outset of these courses, students will share their professional interests with one another and form into teams of 4 – 8 students with similar interests. Each team will then work through the initial steps of the engineering design process (i.e., DEFINE and GENERATE & SELECT) on a project of their choosing. They will also attempt a first, rapid iteration on a design solution. The course does not suggest a challenge space for each team. Rather, students define the area of activity for themselves. Students who are considering enrollment in this course are strongly encouraged to recruit other students to enroll, from all undergraduate majors at the university.

As needed by each team, the instructor will provide personalized instruction on the finer points of the design thinking process and teamwork. To ensure proper support of students across the potentially broad array of intellectual endeavors of the course, the instructor will challenge students to engage with knowledgeable subject matter experts to ensure full support of their team projects.

LEARNING OBJECTIVES

Overall course objectives

All students in the course will confirm or enhance their:

1. Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
2. Ability to function on multidisciplinary teams.
3. Understanding of professional and ethical responsibility.
4. Ability to communicate effectively.
5. Broad education, as necessary to understand the impact of professional solutions in a global, economic, environmental, and societal context.
6. Knowledge of contemporary issues.

Engineering students will also confirm or enhance their:

1. Ability to apply knowledge of mathematics, science, and engineering.
2. Ability to design and conduct experiments, as well as to analyze and interpret data.
3. Ability to identify, formulate, and solve engineering problems.
4. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Design thinking-specific learning outcomes

1. Students will deepen their knowledge of the design thinking process, learn the key steps of the process, understand the essential activities of each step, and apply the process as a tool in development of an original solution concept and in project management.
2. Students will better appreciate the many ways in which multiple disciplines work together to bring a substantive product design solution successfully to market.

Topics covered

1. DEFINE a challenge space.
2. GENERATE solution requirements and concepts.
3. SELECT key solution requirements and a most promising solution concept.
4. EXPLORE a most promising solution concept, by means of a preliminary prototyping effort.

ASSESSMENT & MEASUREMENT

How course outcomes will be assessed

Design Reports (67%)

Throughout the semester, student teams will complete three team assignments built upon the design thinking process. The first and second reports will each count for 25% of the course grade. The third report will count for 17% of the course grade.

Final Poster Presentations (10%)

During the final exam period on December 12th, students will participate in a poster session on their semester-long projects.

Teamwork (20%)

Throughout the course, students will work extensively on team-based activities. Student engagement in weekly meetings with their course instructor will be evaluated. Students will be asked to evaluate their teamwork contributions and the contributions of their partners using an online tool - CATME. When difficult interpersonal situations arise with team members, students will be evaluated on their willingness to work through those difficult situations in an open, supportive, and professional manner. Students will be asked to complete end-of-semester evaluations of their instructor.

Miscellaneous Assignments (3%)

In addition to the main assignments of the course, students will be asked to complete several, additional small assignments.

Late policy

All graded assignments in ENGR 4010 will have specific due dates and times listed in the weekly handouts provided by your instructors. For up to 72 hours after the assignment submission deadline, a student can still submit their assignment through the normal avenue. Submissions received after the due date but before 72 hours have passed will lose 15% of the available points for being late. Submissions received after 72 hours have passed, will lose 40% of the available points for being late.

Course grade scale

A+	> 97%	B+	87 – 90%	C+	77 – 80%	D+	67 – 70%
A	93 – 97%	B	83 – 87%	C	73 – 77%	D	63 – 67%
A-	90 – 93%	B-	80 – 83%	C-	70 – 73%	D-	60 – 63%
F	<60%						

INSTRUCTIONAL MATERIALS

As student teams begin work on each of the major assignments of this course sequence, they will receive an assignment handout with grading rubric. At the same time they will receive a multi-page document with additional, detailed guidance for the assignment. As needed, students will be provided with instructional materials that explain the activities and goals of each major step of the design thinking process. In addition to written and multimedia instructional materials that will be provided, student teams will receive weekly, individualized instruction intended to guide their project work.

LEARNING COMMUNITY INTERACTION & ENGAGEMENT

Learning community values

Meaningful and constructive teamwork and courteous dialogue are expected in this course. Both require a degree of respectful understanding and a willingness to listen to all course participants. You may not agree with another person's point-of-view, or you may already

understand a concept and feel frustrated with the pace of team efforts. Give others a chance to contribute and learn. Encourage one another politely. Seek to understand and appreciate the ideas of others. Learn from one another. Be patient and encouraging as we *all* seek to advance our knowledge of important professional engineering concepts. Since every student is entitled to full participation in this course without interruption, all students are expected to come to class session and team meetings prepared and on time. You are always expected to refrain from undertaking any activities that might be considered disruptive.

Special Needs

The University of Virginia strives to provide accessibility to all students. If you require an accommodation to fully access this course, please contact the Student Disability Access Center (SDAC) at (434) 243-5180 or sdac@virginia.edu. If you are unsure if you require an accommodation, or to learn more about their services, you may contact the SDAC at the number above or by visiting their website at <http://studenthealth.virginia.edu/student-disability-access-center/faculty-staff>.

Honor code

The School of Engineering and Applied Science relies upon and cherishes its community of trust. We firmly endorse, uphold, and embrace the University of Virginia's Honor principle that students will not lie, cheat, or steal, and we expect all students to take responsibility for the System and the privileges that it provides. We recognize that even one Honor infraction can destroy an exemplary reputation that has taken years to build. Acting in a manner consistent with the principles of Honor will benefit every member of the community both while enrolled in the Engineering School and in the future.

If you have questions about the Honor System or would like to report suspicions of an Honor offense, please contact your instructor. For more information on the UVA Honor System, please visit the following web resource: <http://www.virginia.edu/honor/>

Class schedule and time commitment

ENGR 4010 is organized as semi-independent, team-based course. As a result, there will be few times during the school year when the entire class meets in a classroom to listen to a lecture or presentation. Even though there will be few class sessions involving the entire class, student teams will be expected to organize and lead weekly meetings with their course instructor, with each meeting lasting on the order of one hour. During the meeting, teams will provide an update on their recent project activities and their upcoming plans. Their instructor will provide commentary and guidance on their project, including assistance with teamwork and engineering technical activities. Most student time for this course (i.e., eight or more hours each week) should be spent working alone and with team members to conceive of and develop an engineering design concept.

ENGR 4010 is a 1-3 credit hour course at UVA. Most students enroll in 3 credit hours for each course. Students should understand that the U.S. federal government mandates a certain *minimum* student workload for each credit hour earned while in college. By the federal definition, a credit hour is an amount of work that reasonably approximates *not less than* one hour of classroom or direct faculty instruction and a minimum of two hours of out of class student work each week for approximately fifteen weeks for one semester hour of credit, or the equivalent

amount of work over a different amount of time. Students who spend less than the minimum should have no expectation of passing the course.

Use of email

Your instructor will seek to minimize the number of course related messages sent to you by email. Still, email messages to the class, to teams, or to individual students will be necessary from time-to-time. Your instructor expects that you will check your university email account at least one time each day, Monday – Friday during the semester. If an email includes a specific request for a response, it is your instructor's expectation that you will respond in no more than two business days from the time that the email was *sent* to you (not from the time that you read the email). Failure to read and respond to emails from your instructor in a timely manner (as defined above) will have a negative impact upon your participation and collaboration grade.