

ENGI 120 - Introduction to Engineering Design
ENGI 220 – Introduction to Engineering Design II
FWIS 188 – Introduction to Engineering Design and Communication
Spring Semester 2022
OEDK Classroom 114

INSTRUCTORS

Dr. Deirdre Hunter
OEDK B14
713-348-4921
hunterd@rice.edu
Office hrs: TBA

Dr. Faruk Kececi
OEDK B13
kececi@rice.edu
Office hrs: TBA

COURSE ADMINISTRATION

Textbook

Required: The workbook Introduction to Engineering Design; Ann Saterbak and Matthew Wettergreen. It is available at the campus bookstore.

Recommended: The textbook Engineering Design: A Project Based Introduction, 3rd edition; Clive L. Dym and Patrick Little; Wiley, 2013, ISBN 978-1-118-32458-5. Available online.

Course Objectives and Outcomes

Students learn the engineering design process and use it to solve meaningful problems drawn from local hospitals and medical facilities, local companies and organizations, international communities, and around the Rice University campus. Teams of students evaluate design requirements and construct innovative solutions in the Oshman Engineering Design Kitchen.

Course objectives - Students will:

1. Learn to apply the engineering design process to meet the needs of a client.
2. Learn to work collaboratively on a team to design and build an engineering solution.
3. Enhance their understanding of the central place of writing and communication in the learning process and in academic life.
4. Learn strategies for analyzing, synthesizing, and responding to college-level readings.
5. Improve their ability to communicate correctly and effectively in writing and in speech, taking into account audience and purpose.
6. Become comfortable with writing as a process and learn strategies—for instance, prewriting, outlining, and revision—for working through that process.
7. Learn appropriate use of the work of others and, where necessary, specific practices of citation.
8. Learn to articulate oral arguments and to respond productively to arguments of others in formal presentations and in class discussion.

Course outcomes - Students completing the course should be able to:

1. Successfully solve a client-based design challenge by following these critical steps in the engineering design process: a) Define a client's need, b) Complete a design context review, c) Establish design criteria, d) Brainstorm solutions, e) Select an appropriate solution using a Pugh Matrix, f) Prototype and build a physical solution, and g) Evaluate a solution against established design criteria.
2. Work collaboratively on an engineering team to complete an engineering design project.
3. Work collaboratively on an engineering team to present technical reports – both written and oral – with supporting visuals.
4. Work safely in the OEDK.
5. Use a Gantt chart as a project management tool and critique a Gantt chart that lays out an engineering design process.

ENGI 120 does not fulfill the FWIS requirement or carry D3 credit.

FWIS 188 satisfies the FWIS graduation requirements. It cannot be taken pass/fail.

Class Time and Attendance

Class time will be used in a variety of ways, including short lectures, in-class exercises, design team meetings, and student oral presentations. Active engagement is expected of all students in this course. Design teams are expected to work in class, regardless of whether there is an active lecture. To facilitate the classroom learning, all individuals must bring their workbook to each class meeting. No hard copies of any class materials will be distributed, and no sharing will be permitted. Digital technologies (i.e. laptop, cellphone, or tablet) may be used to access digital materials and virtually connect with remote team members.

This is a face-to-face course and students are expected to attend all class meeting times. Because of the heavy reliance on teamwork that occurs during our scheduled class time, it will not be possible to participate in this course asynchronously. However, if you have any of the common COVID-19 symptoms (see this link for the most current list <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html>), or are not experiencing symptoms but have been told to quarantine by a University official, please do not come to class and instead attend remotely. If you are enrolled in face-to-face mode and will not be attending class in person for the day, please send an email to your DM and Instructor immediately to let them know you will be attending remotely. **We want everyone who feels ill to stay home!**

If you miss a class time due to illness or other excused absence, there is still an expectation that the work will be made up. Students are expected to let their instructor know, within the first 3 weeks of the semester, of any religious holidays that will conflict with the course schedule.

Expectations for Remote Attendance

If you are joining the class remotely via Zoom, whether as a full-time remote student or temporarily, you are expected to have your camera turned on for the entire class. You should have your audio muted unless you are asking a question or interacting with your team in a breakout room. The expectation is that you would participate in the conversation as actively as if you were in person, by using the chat feature or raised hand feature in Zoom.

Team Formation and Expectations

Students will work in their design team throughout the entire semester. Teams will be formed based on student interest and skills. Students completing the project preference form are expected to commit to the class for the entire semester. Students will have design team meetings during most class periods. For this reason, attendance in person is expected of all students except for illness or emergency. ***Design teams are also expected to meet outside of class.*** Each member of the design team is expected to contribute equally to the project. While types of contributions will vary, effort should be comparable. It is also important that regular team requirements rotate. For example, one person should not act as the recorder for every meeting; rather, everyone on the team should take turns with this job. Peer evaluation of teammates will be conducted using the online CATME system. Instructor input will be valued as well, using the process described below.

Honor Code Policy

Collaboration is essential for the success of this course and of your team; thus, collaboration is expected. It is important that the design work and communication assignments be spread out among the members of your team. The exam will reflect individual effort and will be pledged.

ASSIGNMENTS

Course Assignments and Schedule

Many of the assignments for the course are the team-based memos, oral presentations, and prototype demonstrations. A few assignments will be individually based – exam, videos and quizzes, ePortfolio, and class participation. *Due dates for all assignments, including any revisions throughout the semester, can be viewed on Canvas and the course Gantt chart:* <https://app.instagramantt.com/shared/s/1201500681859033/latest>

Grading Policy

The final grade will be based on the percentages shown in Table 1. All members of the team will receive the same grade for Oral presentations I and II and the quality of final prototype. Individual student performance will be assessed through the exam and the participation grades. The grades for the memos will be based on both individual and team contributions, as described below.

Table 1: Calculation of Course Grade.

Assignment	% of Final Grade
Written Memos	
Team: Technical Memos (TM) #1-9, Test Result Slide	15%
Individual: Self-reflection Memos (SM): Pre-SM**, #10, 11, and 12** Final submission of e-portfolio	10%
Team: Design proposal (Oral presentation I)	15%
Team: Final design & prototype demo (Oral presentation II)	15%
Team: Prototype Evaluation	15%
Individual: Participation in a Team: CATME, attendance, instructor evaluation	10%
Individual: Completion of Quizzes	5%
Individual: Participation with mentors: workshops, WM/FM meetings, survey completion and project transfer documents	5%
Individual: Exam	10%

** FWIS 188 Students only

Technical and Self-Reflection Memos

Technical Memos record the progress of the design teams. There will be a total of 9 technical memos (TMs). Six (6) of these will be formal technical documents, written as a team, that include the products of the engineering design process and are no more than 2-4 pages of written text. Three (3) of these will be e-portfolio entries, also written as a team, and focus on the design products of the team project, with brief descriptions of the design products (e.g. tables, diagrams, images).

Additionally, there will be individually written self-reflection memos (SMs). These memos will be expository (not technical) in style with a focus on the individual role as an engineer and as a team member. **Note that Pre-SM, and SM #12 will only be written by FWIS enrolled students.

All written memos should be uploaded to the appropriate Canvas or Digication assignment by the corresponding due date, for the team written documents only one submission per team is needed. TMs #1 – 8 and SM #10-11 will be graded on a ✓+, ✓, ✓- scale. Points for these memos will be awarded on a completion basis, where a ✓+ or ✓ is sufficient for completion. Memos receiving a ✓- will need to be revised and resubmitted as a version 2 (V2). Once completion of a TM or SM is achieved, the assignment will be awarded full credit (5 points). TM #9 and SM #12 will be graded on a 20-point scale. Only a version 1 (V1) will be submitted for TM #9 and SM #12.

Oral Presentations

Oral presentations will be given two times during the semester. Every member of the team will be expected to present once during the semester. Oral Presentation I will be given by two or three members of the team. Oral Presentation II will be given by two or three different members of the team. A team grade will be assigned for Oral presentation I and II (each at 15%).

Prototype Evaluations

The quality of the final physical prototype will be evaluated based on the completed prototype and evidence of meeting the design criteria as described in the final prototype evaluation. Overall, the quality of the final prototype counts 15%. There will be two prior non-graded prototype evaluations during the semester to guide your prototyping development.

Participation

An individual score reflecting your *Team Participation* will be given three times during the semester. The individual team participation grade is based on technical contribution, peer evaluation, instructor evaluation, self-evaluation, attendance, etc. Peer evaluation will be formally evaluated using the CATME software. The course instructor makes the final decision about a student's team participation score, which counts as 10% of the final grade.

Individuals are expected to watch the assigned videos and complete the on-line quizzes. Completion of these tasks will earn full credit for the *Completion of Quizzes* portion of your grade (5%).

Student's *Participation with Mentors* will be evaluated in a number of ways and is 5% of your final grade. This grade will be assessed for each student individually. 1) There are workshops scheduled throughout the semester. Two will be

mandatory: a hand tools workshop and an electronics workshop; and an optional CAD workshop. 2) Teams are expected to meet with their faculty mentor (FM) either in-person or virtually at the discretion of the team and FM, 10 times (i.e., weekly) during the semester. Typically, two or three members of the team meet with the faculty mentor. Each meeting is expected to be 15-20 minutes in length; meetings will not occur during class time. Each student is expected to attend at least 5 meetings. 3) Attend and participate in Writing Mentor meetings. 4) You will be required to complete surveys at specific times during the semester, including CATME peer evaluations. These surveys help us to improve the mentoring program and teaming. 5) At semester end, students are required to make transfer documents for their project such that a new team could potentially continue work on the project. Completion of these tasks and attendance in these meetings will earn full credit for this portion of the grade.

Take-Home Exam

The timed exam for this course covers your knowledge of the engineering design process and is not specific to your design project. It consists of free response questions and interpreting products of the design process (e.g. tables, figures, etc). The exam is closed-notes, closed-book with the exception of one 8x11" study sheet. It is a pledged exam based on individual effort. The exam will be due on **Thursday, April 7 at 12pm (NOON)**.

Late Assignment Policy

No late assignments will be accepted without permission of the instructor before the assignment is due. Illness and family emergencies will be dealt with on an individual basis. Individual and team grades on assignments that are turned in late will be reduced 25% per day (including weekends).

Lastly, teams that fail to clean their workspace and check out through proper OEDK procedures will have their final grade withheld, until their team table has been cleaned.

Any student with a documented disability needing academic adjustments or accommodations is requested to speak with the instructor during the first two weeks of class. All discussions will remain confidential. Students with disabilities should also contact the Disability Resource Center in the Allen Center.

COURSE SUPPORT

Faculty Mentor Support

Faculty mentors will support teams both in and out of class. These individuals are all gifted teachers and engineers and are a tremendous technical resource for teams. These faculty mentors are committed to helping your team solve its design challenge.

Engineering and Leadership Support

Embedded Design Mentors (DMs) will be supporting teams in the class. The embedded DMs are Rice students and ENGI 120 alumni with experience in design and teaming. OEDK lab technicians and assistants will offer technical support in the OEDK once prototyping begins and continuing until the "final exam" date assigned by the Registrar.

A workshop instructing Computer Aided Design (CAD) will be held on the Thursday or Friday of Week 4, times will be announced via a Canvas announcement at a later time. One member of each team is suggested to attend.

Basic hand tool workshops will be offered in Week 8 of the semester. Sign-up link will be sent via Canvas announcement later in the semester. All students are expected to attend one of the hand tool workshops. You do not need to attend with your team. There will modified version for our remote students.

Basic electronics workshop will be held during class, refer to Gantt chart for the date. All students are expected to participate in the electronics workshop.

There will be several afternoons when the DMs and/or instructors will hold open prototyping workshops. All teams are encouraged to spend the entire workshop in the OEDK prototyping their projects at the same time, with remote students attending virtually. This is a good opportunity to share and obtain just-in-time prototyping assistance from

your peers. The dates for these sessions will be held the Sunday prior to each prototype evaluation from 1:00-5:00pm, as noted in the course Gantt chart.

Support for Writing Assignments

Writing mentors will assist student teams in preparing high quality memos. Writing conferences will be held for all teams or individuals on the day preceding the due dates of the memos. Conference times will be Sunday afternoon and evening for memos due on Monday; conference times will be Wednesday afternoon and evening for memos due on Thursday (if applicable). Writing Mentors decide whether meetings will be F2F or virtual. All Team Members are required to attend their writing conferences for TM1. For all remaining memos, one or more of the authors is expected to attend. A complete draft of the V1 and V2 memos should be uploaded to Canvas at least 24 hours prior to the writing conference times to give the writing mentors sufficient time to prepare for the conference. Additional information about expectations of memos and writing conferences will be provided at a later time.