JOHNS HOPKINS
WHITING SCHOOL
of ENGINEERING

Syllabus

EN.500.110 Explore Engineering Innovation, Summer 2022

Contents

About the Course

Description

Explore Engineering Innovation (EEI) is an exciting college-level summer program for motivated high school students with an aptitude in math and science and an interest in (or curiosity about) engineering. This program has been available to high school students since 2006. In the program, students learn to think and problem-solve like engineers and have the opportunity to earn Johns Hopkins University (JHU) credit.

This is a course of lectures, laboratories, and special projects. Its objective is to introduce students not only to different fields of engineering, but also to the analytic tools and techniques that the profession uses. Assignments include hands-on and virtual experiments, oral presentations of product design, and design/construction/testing of structures.

For more information, visit https://ei.jhu.edu.

Prerequisites

- High school algebra II and trigonometry
- High school chemistry or physics
- As and Bs in high school math and science courses

Objectives

- To introduce students to prevalent topics in engineering
- To prepare students for rigorous college engineering programs
- To help students develop problem solving strategies and confidence
- To assist students in determining whether engineering is a career they are interested in pursuing

Modules

- Chemical Processes
- Electronics
- Engineering Design
- Error and Uncertainty
- Ethics
- Excel
- Finance
- Materials
- Statics
- Technical Communication
- Units and Dimensions

Textbook

This course does not have a textbook. All course materials are found on the course Canvas site or Microsoft Teams.

Teaching Team

The course is taught by an instructor with support from a teaching fellow (TF) and possibly a teaching assistant (TA). Teacher biographies and contact information can be found in Canvas under the Getting Started module.

Schedule

Class meets every weekday for six hours. Part of this six-hour meeting will include a break for lunch. A calendar with due dates is available in the Calendar area of the Canvas course menu. Unless otherwise noted, **all homework is due at the beginning of class.**

Access

Required Software

You will need access to a computer with the following capabilities:

- Access to a spreadsheet application which will allow them to analyze data*
- Access to a word processing program that can be used to write their course lab reports*
- Access to a presentation program so they can create a presentation for their final project*
- Ability to upload videos to the internet
- USB port to communicate with the Adafruit Circuit Playground Express
- Reliable internet access

*All students are granted a Microsoft Office 365 license during the program.

Johns Hopkins Online Account

The Johns Hopkins Enterprise Directory (JHED) system is an online, comprehensive source of contact information for Johns Hopkins University faculty, staff, and students that grants access to the following resources:

- Canvas – access the course files
- Microsoft Teams – communicate with the class

- [Microsoft Office 365](#) – access Word, Excel, PowerPoint, OneDrive, etc.
- [myJHU](#) – view and update your student profile
- [SIS](#) – view your final grade at the end of the course
- [Library](#) – access online reference materials

Sign into these applications using JHEDID@jh.edu (**NOT @jhu.edu**) and your password.

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Sign in

jhedid@jh.edu

Can't access your account?

Sign-in options

Back | Next

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← kborgsm1@jh.edu

Enter password

Password

Forgot my password

Sign in

New students should receive an email from the registrar containing their JHED ID shortly after enrollment. Instructions for activating the account are provided in the Online Account Activation Instructions Form during course enrollment. Contact webregistration@jhu.edu or call 410-516-8080 for assistance, if needed.

Canvas – Course Materials

All course materials will be provided through [Canvas (canvas.jhu.edu)](http://canvas.jhu.edu). Sign into Canvas using your JHEDID@jh.edu (**NOT @jhu.edu**) username and password.

The course materials are divided into modules, which can be accessed by clicking Modules on the Canvas course menu. A module will have several sections including the overview, lecture videos, discussions, and assignments.

Microsoft Teams – Communication

This course will use Microsoft Teams for communication. This is [a platform that works in your browser, on your desktop, and has an app for tablet and phone (iOS and Android)](#), so you can participate from whatever device you are most comfortable. To access Teams in a browser, navigate to https://teams.microsoft.com.

Sign in with your JHU email using @jh.edu (**NOT @jhu.edu**) and JHU password. Your course Team will not be visible until the Saturday before the first day of class.

There are various channels to organize discussion by topic. To customize your channel notifications, click the dots next to the channel name and select Channel notifications. You can also customize your notifications by going to Settings > Notifications (in desktop/browser, click your initials in the upper right-hand corner to find the Settings menu). Teams has many different notifications on its different platforms so [make sure you have them configured](#) so you get the communications you need.

For more information, check out the [Microsoft Support information](#) for getting started with Microsoft Teams. If you have difficulty logging in or accessing Microsoft Teams, please contact the Help Desk at cldtsupport@jhu.edu.

Microsoft Office 365 Software

While you are enrolled in the course, you will have access to the software included in the Microsoft Office 365 Suite such as Microsoft Word, PowerPoint, and Excel. You will need your JHED to download the software to your device.

- Go to https://www.office.com and click Sign In.
- Sign in using JHEDID@jh.edu (**NOT @jhu.edu**) and your password.
- When you land on the Office.com home screen, you can click Install Office in the upper right corner. Installing the software in optional; you can also use the web versions directly in the browser.
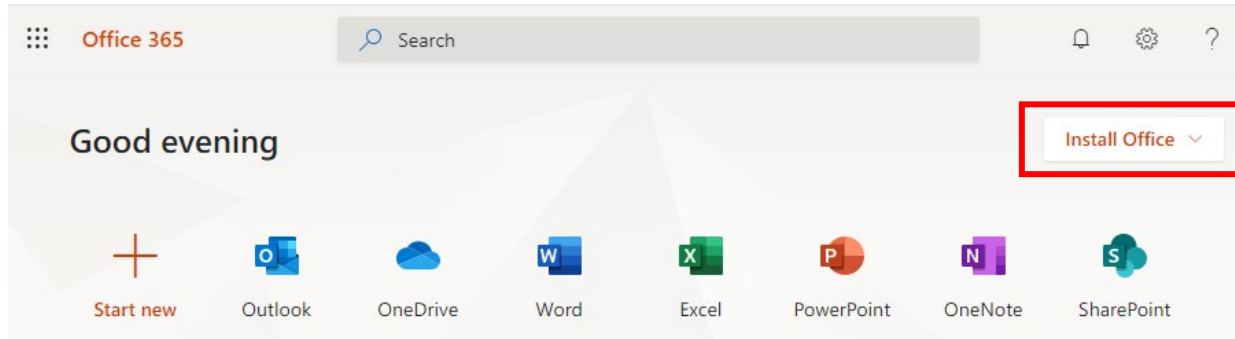
Communication

Course Announcements

Important announcements will be posted to Microsoft Teams. You should check for new announcements each day.

Public Questions via Teams Channels

Questions about the course should be posted in the relevant channel in Microsoft Teams. Please refrain from sending private messages to your teachers—instead, ask questions in Microsoft Teams channels as much as possible so that the entire class can benefit from reading the answer. Your classmates might even know the answer to your question and respond to you before a teacher does! Students can post replies to questions from their peers, and this behavior is encouraged! In addition to written replies, it's also helpful to "like" posts by clicking on a post then selecting the thumbs-up icon.

Personal Questions via Teams Chat

Direct chat messaging should be reserved for content that is not relevant to the whole class (late assignment, accommodations, etc.). To start a chat group with your teaching team, select Chat on the left-hand menu of Teams and click the New Chat icon (🖉) above the chat list pane. Type in the names of all your teachers to add them to the group. **Please refrain from chatting with an individual teacher; instead, chat with the whole teaching team.**

Interacting with Peers

You are encouraged to discuss the course content with your peers. In addition to posting and replying to messages in the public Microsoft Teams channels, you can also use Microsoft Teams to chat with individual students or groups of students.

Be respectful and reach out to a teacher if you believe someone is behaving inappropriately. Recall that you are bound by the Academic Integrity policy for the duration of this course.

Grading

Submission Format

Documents should be submitted in PDF format. Videos should be created as .mp4 or .mov format, uploaded to Microsoft Stream, and shared via a link to the video.

Typed submissions are preferred, but handwritten work can be scanned or photographed and included within a Word document. One option is to use a program like CamScanner to digitize handwritten work. Please take the time to ensure scans are not blurry, handwriting is legible, pictures are not sideways, and text and photos are not too small.

Late Policy

Unless otherwise noted, **all homework submissions are due at the start of class**. Large files take time to upload, so you should not wait until the last minute to submit your work.

Because this course moves at a fast pace, in general, late work will not be accepted. Submitting something on time is better than submitting nothing. There are a few exceptions to this rule:

- All students will be able to submit one assignment or activity late (up to 12 hours late) with no penalty.
- The second late assignment (up to 12 hours late) will be penalized at 50% credit
- Exceptions will be made for genuine hardships experienced during the course.

You should contact your teaching team as soon as possible to let them know why an assignment is late.

Grade Questions and Regrade Policy

You may submit work to be regraded if they feel there is an error or if you have questions about how it was graded. Requests should be made in-person or via Teams chat with the teaching team within 48 hours of the grade being posted in Canvas. You should indicate what portion of the work should be regraded and explain the rationale for your request. The new grade may be higher, the same, or lower than the original grade. Once work is regraded, it may not be submitted for another regrading analysis.

Grade Calculation

Final grades will be determined by the following weighting:

Item	# Points	% of Grade
Spaghetti Bridge Project	400	20%
Electronics Project	300	15%
Assignments	280	14%
Quizzes	240	12%
Class Participation	240	12%
Chemical Processes Project	160	8%

Request for Proposal Project	140	7%
Mousetrap Project	120	6%
Ethics Project	120	6%
TOTAL	2000	100%
Extra Credit (External Course Evaluation)	10	

Final Grade Letters

Your grading scheme—chosen at the time of enrollment—is either a Letter Grade or S/U Grade. The final grade letter or S/U is based on the final grade percentage according to the table below. To calculate the final grade percentage:

1. Determine the number of points you earned for each item in the Grade Calculation table by following the instructions given in the syllabus section titled Major Deliverables.
2. Add the number of points you earned for each item in the Grade Calculation table.
3. Divide by the total possible number of points (2000) and convert this value to a percentage.

Letter Grade	S/U Grade
93% ≤ A 90% ≤ A- < 93% 87% ≤ B+< 90% 83% ≤ B < 87% 80% ≤ B- < 83% 77% ≤ C+< 80% 73% ≤ C < 77% 70% ≤ C- < 73% 67% ≤ D+< 70% 63% ≤ D < 67% F < 63%	Satisfactory (S): 70% and above Unsatisfactory (U): Below 70%

Students who earn a final grade percentage of 70% or above will also receive a Certificate of Completion. Certificates will be sent by email from ei@jhu.edu approximately four weeks after the last day of class.

Major Deliverables

Spaghetti Bridge Project

You will test the material properties of spaghetti and use truss analysis (statics) to design, build, and test a bridge made of spaghetti and epoxy.

The deliverables for the Materials labs are written lab reports. You will collect data and complete lab reports for tension and bending. You will then write the experimental methods, collect data, and complete a lab report for buckling.

The deliverable for the group bridge design is the group's choice of either a poster, a written report, or a video presentation.

The points for this project are allocated as follows:

- 200 pts – Materials labs (tension, bending, and buckling)
- 100 pts – Group bridge design
- 100 pts – Group bridge build and test

In total, deliverables for the Spaghetti Bridge Project are worth 400 points (20% of the final grade).

Electronics Project

You will use [MakeCode](#) block programming, [JavaScript](#), or [CircuitPython](#) to control a [Circuit Playground Express](#) (a programmable circuit board with built-in sensors, buttons, and lights). After working in a group to build a memory game, you will be given a design challenge: build a device that will help the user live a healthier life. Emphasis is placed on transferable skills like defining the problem, writing use cases, debugging, developing verification procedures, and creating documentation.

The deliverables for the individual design challenge are the code, a user guide, and a demonstration video. Projects are then peer reviewed.

The points for this project are allocated as follows:

- 125 pts – Group project
- 145 pts – Individual project (code and user guide)
- 30 pts – Peer review

In total, deliverables for the Electronics Project are worth 300 points (15% of the final grade).

Assignments

Assignments are questions or activities designed to give you practice with the course content. You should complete assignments on your own, not in a group.

Assignment links are provided in the corresponding Canvas modules. You are required to submit your work to Canvas as a PDF file. All work must be shown and legible to earn full credit. Solutions without justification will not be considered complete and the grade will be adjusted down accordingly.

Each of the following assignments is worth 40 points:

- Units and Dimensions Assignment
- Chemical Processes Assignment
- Excel Assignment
- Electronics Assignment
- Error and Uncertainty Assignment
- Finance Assignment
- Statics Assignment

In total, the assignments are worth 280 possible points (14% of the final grade).

Quizzes

Each module includes quizzes composed of multiple choice and fill-in-the blank style questions. You should complete quizzes on your own, not in a group.

Quiz links are provided in the corresponding Canvas modules. The quizzes are designed to test the concepts and skills covered in the module lectures, so you should plan to complete all lectures and

readings before attempting the quiz. Quizzes are untimed, and you can attempt each quiz up to 2 times. Feedback on the quiz will be available after the quiz due date.

Each of the following quizzes is worth 20 points:

- Engineering Design Quiz
- Units and Dimensions Quiz
- Chemical Processes Quiz
- Excel Quiz
- Electronics 1 Quiz
- Electronics 2 Quiz
- Technical Communication Quiz
- Ethics Quiz
- Materials 1 Quiz
- Materials 2 Quiz
- Materials 3 Quiz
- Error and Uncertainty Quiz
- Finance Quiz
- Statics 1 Quiz
- Statics 2 Quiz

The lowest three quiz grades will be dropped. So, the highest 12 quiz grades will count toward the final grade for a total of 240 possible points (12% of the final grade).

Class Participation

Engineering is a collaborative activity that requires active participation. During class you will be asked to work in small groups to complete projects, conduct discussions, or solve engineering challenge questions. You must follow instructions and work productively with your classmates.

Participation is worth 15 points for each of the 19 meeting days. The lowest three participation grades will be dropped. So, the highest 16 participation grades will count toward the final grade for a total of 240 possible points (12% of the final grade).

Chemical Processes Project

You will design an experiment to convert cornstarch to sugar using an amylase enzyme. During this process you will calculate the percent conversion and the energy efficiency of the heating element. The Chemical Processes Project is worth up to 160 points (8% of the final grade).

Request for Proposal Project

You will work in teams to refine one team member's individual electronics project. Then, you will create a presentation to pitch the product to your peers. This is an exercise in technical communication and the engineering design process. The Request for Proposal Project is worth up to 140 points (7% of the final grade).

Mousetrap Project

You will design a paper mousetrap and create instructions for how to build it. A classmate will then attempt to recreate the device by following the instructions and provide feedback on your design or instructions. This is an exercise in the engineering design process and technical communication. The Mousetrap Design is worth 70 points and the Mousetrap Build is worth 50 points, for a total of up to 120 points (6% of the final grade).

Ethics Project

You will learn about the National Society of Professional Engineers' (NSPE) code of ethics and apply it to one of several case studies. You will read one or two provided articles, respond to short-answer questions, and construct an argument for peer review. The Ethics Project is worth up to 120 points (6% of the final grade).

Surveys

The Engineering Innovation office hires an external evaluator to assess the strengths and weaknesses of this course. Student feedback is essential to that process. Survey responses are anonymous; neither the teaching team nor the Engineering Innovation office can match students to survey responses.

A pre-course survey will be sent by email on or about the first day of class. A post-course survey will be sent by email during the last week of class. In addition, there are anonymous weekly surveys that are available in Canvas. Your participation is voluntary.

Students that complete both the pre-course survey and the post-course survey will earn 10 points extra credit.

Policies

Academic Integrity

All students are required to read, know, and comply with the Procedures for Dealing with Issues of Academic Misconduct as detailed in the enrollment form you signed.

This policy prohibits academic misconduct, including but not limited to the following: cheating, plagiarism, submitting the same or substantially similar work to satisfy the requirements of more than one course without permission, submitting as one's own the same or substantially similar work of another, knowingly furnishing false information to any agent of the University for inclusion in academic record, falsification, forgery, alteration, destruction or misuse of official University documents or seal.

Plagiarism is defined as taking the words, ideas, or thoughts of another and representing them as one's own. If you use the ideas of another, provide a complete citation in the source work; if you use the words of another, present the words in the correct quotation notation (indentation or enclosed in quotation marks, as appropriate) and include a complete citation to the source.

Disability Services

To receive accommodations for a disability, students must register with the JHU Office for Student Disability Services (SDS) at https://studentaffairs.jhu.edu/disabilities/. Students are highly encouraged to do so as soon as possible after admission and no later than two weeks prior to the start of class. Although requests can be made at any time, there may be a delay in implementation depending on the nature of the request.

To begin the registration process with Student Disability Services and to establish eligibility for disability related accommodations and services, please complete and submit the SDS Online Registration Form and upload supporting documentation. You can also find this form by visiting the Student Disability Services website at https://studentaffairs.jhu.edu/disabilities/ and clicking on the link on the left hand side labeled 'SDS Homewood Online Registration for New Students.'

Once your form and documentation are received, the next step in the process will be a phone call or virtual meeting with an SDS professional staff member, when needed, to complete your requested accommodations. If you have any difficulty providing documentation or need more information about any aspect of the process, please contact SDS staff at studentdisabilityservices@jhu.edu.

Discrimination and Harassment

JHU will not tolerate harassment, sexual harassment (including sexual violence), discrimination or retaliation in the workplace or educational environment whether committed by managers, faculty, administrators, staff, or students, or by visitors to our institution of higher learning. If you are a victim of any such situation, you are strongly encouraged to file a complaint through official university channels.

You may reach out to the Engineering Innovation office at ei@jhu.edu or submit a Discrimination and Harassment Report Form to the JHU Office of Institutional Equity - https://forms.jh.edu/view.php?id=164822.