Syllabus

EN.800.102 Sustainable Energy Engineering, Summer 2025

Contents

About the Course

Description

Fossil fuels will eventually run out, and before they do, burning them for energy production will continue to contribute to our warming planet. Where does all the energy we use go, and how can we use less of it? Recognizing that even with reductions in our energy use we will still need to make changes to energy production, how can we design and implement new sustainable energy technologies that are resilient, economical, and compatible with the existing power grid? To answer these questions, we need to take a close look at the ways we currently use energy so that we may identify opportunities to reduce consumption. We must also study the scientific and engineering principles behind current methods of energy production and distribution, as well as the impact of policy on our ability to make change. This course will introduce students to these topics, providing the fundamental knowledge necessary to understand the challenges and opportunities in sustainable energy engineering and to determine whether this is a field they wish to pursue.

Prerequisites

- High school algebra II
- High school science course with lab
- As and Bs in high school math and science courses

Objectives

By the end of the course students will be able to:

- Describe the importance and impact of sustainable energy production and energy efficiency measures
- Describe the basic operation of the electric grid and the challenges associated with integrating more intermittent energy generation

- Use physical prototypes to demonstrate important properties of an AC generator, a wind turbine, and a photovoltaic array
- Apply engineering principles to estimate the capacity of a hydropower, solar, or wind power plant in a specific geographic area
- Perform basic calculations to estimate the cost effectiveness of an energy efficiency improvement or a small-scale power generation technology
- Describe the pros and cons of each sustainable energy source

Topics

- Energy in our daily lives
- Buildings and transportation
- The electric grid
- Hydropower, wind power, and solar power
- Additional sources (biomass/biofuels, geothermal, nuclear, hydrogen and fuel cells, and marine energy)
- Energy cost and policy

Textbook

There is no textbook for the course. Recommended reading will be available online through publicly available websites or through the Johns Hopkins University library.

Teaching Team

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

Schedule

Class meets every weekday for six hours (excluding the July 4 holiday). Part of each 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 to analyze data*
- Access to a word processing program to write course lab and project reports*
- Access to a presentation program*
- USB port to communicate with the Vernier GoDirect Energy Sensor
- 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 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.

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). Sign into Canvas using your JHEDID@jh.edu (**NOT @jhu.edu**) username and password. If you have difficulty logging in or accessing the course on Canvas, please contact the Help Desk at cmtshelp@jhu.edu.

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. You will have access to the Canvas site for one month following the last day of class.

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 is optional; you can also use the web versions directly in the browser.

Communication

Course Announcements

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

Canvas Inbox

Canvas Inbox (also called Conversations) can be used for communication outside of class. Inbox is a two-way messaging tool used instead of email to communicate with members of a

course, a group, or an individual user. You can communicate with other people in your course at any time. Check out the Canvas Inbox guide for students.

You are encouraged to discuss the course content with your peers. 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.

Canvas Notifications

Ensure you don't miss any important notifications by choosing your preferred email address and customizing your Canvas notification settings to notify you of changes immediately or as part of a daily summary. See the Canvas Notifications guide for students.

Grading

Grade Calculation

Final grades will be determined by the following weighting:

Category	% of Grade
Homework Assignments	25%
Capstone Project	25%
Final Exam	25%
Group Labs	20%
Participation	5%
TOTAL	100%

Homework Assignments are individual work to apply conceptual knowledge from the lectures.

The **Capstone Project** is a group effort that consists of several small projects that build on the individual homework assignments and culminate in the design of a sustainable retreat center that you will present on the last day of class.

The **Final Exam** is an in-class and closed-book exam covering content from all course modules. Questions on the final exam will be pulled from a set of questions available to you via practice quizzes. The practice quizzes are not graded, and you can take the practice quizzes as many times as you wish.

During **Group Labs** you will work in a group to demonstrate essential properties of sustainable energy generation using physical models, including a handheld AC generator, a tabletop wind turbine, and a small photovoltaic solar array.

Participation includes written reflections after major assignments, evaluation by teachers of participation in class, and evaluation by peers of work on group assignments.

The projects that fall under each category are shown in Canvas. You can sort assignments by type or sort them by date. Note that projects completed as part of this course are not considered independent research and do not meet the threshold for publication.

Final Grade Letters

Your grading scheme—chosen at the time of enrollment—is either a Letter Grade or S/U Grade. You can switch grading schemes by submitting a request to the Registrar (https://support.sis.jhu.edu/case/) on or before the deadline. The deadline for Summer 2025 is July 18.

Letter Grade	S/U Grade
97% ≤ A+ 93% ≤ A < 97% 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%

Late Policy

Unless otherwise noted, all homework is 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, submitting work late is problematic. Often, feedback received on an earlier assignment can be used to improve your work on later assignments, so receiving delayed feedback can have downstream effects. Care has been taken to ensure all due dates allow time for you to attempt the assignment and ask questions if needed. Late assignments submitted within 24 hours of the due date will be penalized 50%; submissions after 24 hours will receive a grade of zero.

Exceptions can be made for genuine hardships experienced during the course, so please contact your teaching team as soon as possible to let them know why an assignment is or will be late if you believe you should get an exception.

Grade Questions and Regrade Policy

You may submit work to be regraded if you feel there is an error or if you have questions about how it was graded. Requests should be made in-person or via Canvas Inbox 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.

Policies

Surveys

The Engineering Innovation office hires an external evaluator to assess the strengths and weaknesses of this course. Your feedback is essential to that process. 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. Your participation is voluntary.

Academic Integrity

You 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.

Generative Artificial Intelligence (AI) Tools

Use of generative artificial intelligence (AI) tools such as Bard and ChatGPT can augment learning experiences when used appropriately. You may use generative AI to brainstorm and refine ideas, find reliable sources, outline, check grammar, and format bibliographies. You should note, however, that the material generated by these programs may be inaccurate, incomplete, biased, or otherwise problematic. You are ultimately responsible for what you submit.

Use your interaction with AI as a learning experience. Then, let your submitted work reflect your improved understanding. All writing and calculations you submit must be your own. Beyond bibliographies, you are not allowed to copy and paste material generated by AI and use it in your submitted work. Including AI-written content in any part of your submitted work will be considered academic misconduct.

Disability Services

Johns Hopkins University and the Engineering Innovation program are committed to making all courses, support services, and facilities accessible to students with disabilities. If you will need disability related accommodations, you will need to start the process of requesting accommodations with the Student Disability Services (SDS) and provide documentation of your disability as well as your need for accommodations. It is recommended that Engineering Innovation students complete this step as early as possible to ensure there is time to request and implement accommodations.

Learn about how to get started with student disability services and/or contact Student Disability Services for more information.

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.