

Physics 130/Environmental Studies 130
Science of Renewable Energy
Fall 2023

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MWF 1:10 – 2:10 OLRI 150

Introduction

This course provides a detailed treatment of the state-of-the-art science and engineering of electrical power generation by renewable sources such as solar and wind, their integration on the grid using energy storage, and aspects of sustainable design that are important for minimizing the environmental impacts of energy use. The purpose of the course is to provide a broad and rigorous foundation in the basic science, technology, and economics of energy to inform policy decisions. It can also serve as an introduction to renewable technology for those are interested in pursuing scientific and engineering research in this area. While energy policy will not be a focus of the course, we will touch upon some aspects of policy when appropriate.

Prerequisite and Materials

There is no textbook for the class, but there will be numerous handouts (on Moodle) throughout the semester. There are no prerequisites for the class, but students are expected to be able to do basic algebra such as ratios and proportions. Excel spreadsheets will be used for several assignments, but no previous experience with Excel is required and the basics will be covered in class.

Class Structure

A typical class will have approximately ½ hour of lecture (mostly power point) and worked example problems. In the second half of class, you will break into smaller groups of 4 and work together on additional problems, computer exercises, and some simple labs.

Assignments

Homework: Homework problems will be assigned approximately weekly, due a week after assignment. You are encouraged to consult with each other on the problems after you have made your best effort to solve the problems on your own. You can also consult with the course SIs and the instructor. However, each student must still submit their own copy of the problems. The Problem Sets will count in total 36% of your grade.

Quizzes: There will be four quizzes, each about ½ hour in length. Each quiz will count 8% (32 % total) toward your grade. There is no final exam.

Reading reflections: There will be a few 1-page weekly reading reflections on assigned readings. The readings will count in total 12% toward your grade.

Final project: In small groups, you will give a final project presentation to the class during the last couple weeks of class. More details on the final project, including possible topics, will be provided after fall break. The final project will count 12% toward your grade. During the last few weeks of the course other assignments

will be minimized to allow for work on your project (and the last quiz will be before project presentations begin)

Attendance: Attendance will count 8 %. Unexcused absences will result in a grade deduction.

Contract for a B:

If you complete all of the assigned work, have no unexcused absences, and have an average score of at least 70% on the quizzes, you will receive at least a B grade for the course.

Attendance and Consultation

Since there is no textbook for the course, the material presented in class is your only source for the homework and the exams (readings will be *supplementary* to class material). Therefore, *class attendance is mandatory*. We cover a lot of ground every class, so if you have to miss a class you need to get the notes from another student.

Stay Well!

It is normal for a student to experience times of stress during the semester. Also you might experience a personal or family crisis. *Your physical and mental health is paramount*. It is important to eat when you are hungry, drink water, use the restroom, and step out of (or away from) class if you are upset or need some air. Please do what is necessary so long as it does not interfere with your or others' ability to be present in the course. If you are having a difficult week and need accommodations on attendance or assignment deadlines please reach out to me. If you have frequent and on-going issues that require professional attention, you should contact the [Hamre Center](#).

Tentative Schedule

<u>Week</u>	<u>Topic</u>
1	Energy and Power Fundamentals
2	Types of Energy
3	Electrical Energy
4	Thermodynamics and Power Plants
5	Basic Energy Economics, Hydro, Geothermal, Nuclear
6	Solar Energy
7	Solar Energy
8	Wind energy
9	Grid integration and Energy storage
10	Transportation
11	Sustainable Design
12	Project Presentations

Other Resources

Disability accommodations

I am committed to ensuring access to course content for all students, including those with disabilities. If you have a disability and have not yet obtained a plan or are unsure if you have a disability that requires accommodation, please contact Disability Services: disabilityservices@macalester.edu, or call 651-696-6275.

The MAX Center

The [MAX Center](#) is Macalester's academic resource center. I strongly encourage you to take full advantage of any and all of the excellent resources they provide there, as they are committed to supporting all students to succeed at Macalester.

Public Health and Wellness

I am strongly committed to the health and safety of all of you, myself, and everyone in our respective communities and beyond. When we are in class together on campus, we will follow the college's COVID policy. If you do not feel well for any reason or are exhibiting any symptoms of COVID-19, please do not come to class. Wear a mask if you think you may have a cold or flu.

Religious Observation

Students may wish to take part in religious observances that occur during the semester. If you have a religious observance/practice that conflicts with your participation in the course, please contact me before the end of the second week of the semester to discuss appropriate accommodations.

Sexual Harassment

Macalester is committed to providing a safe and open learning and living environment for all students, staff, and faculty. Any community member experiencing sexual harassment, sexual violence, relationship violence, or stalking, is encouraged to seek help and support.

Please be aware that as a faculty member, I need to report disclosure about sexual harassment, sexual misconduct, relationship violence, and stalking to the Title IX Office. The purpose of this report is to ensure that anyone experiencing harm receives the resources and support they need. I will keep this information *private* and it will not be shared beyond this required report.

You may also contact Macalester's Title IX Coordinator directly, to assist with supportive measures, resources, and referrals:

- Phone: 651-696-6258 Email: titleixordinator@macalester.edu
- File a report: [Title IX & Sexual Misconduct Report Form](#)

If you prefer to speak with someone confidentially, or need 24/7 support, there are resources available on- and off-campus to assist you: [Counseling Services](#) at the Hamre Center – on-campus counseling resource for students

- **Free, Urgent, Phone Counseling (Press 2) is available to Macalester students anywhere in the world, 24/7/365.** Speak to a licensed mental health counselor 24 hours a day by calling Hamre Center at 651-696-6275, then press or say option 2 when prompted.

- [Center for Religious and Spiritual Life](#) – chaplains may be reached via 651-696-6298 or email religiouslife@macalester.edu
- [SOS Sexual Violence Services of Ramsey County](#) 651-266-1000 (24-Hour Crisis Hotline staffed by trained advocates)
- [Rape, Assault, and Incest National Network \(RAINN\)](#) 1-800-656-4673 (24-Hour Hotline and Live Chat)
- Additional local and national resources can be found at <https://www.macalester.edu/title-ix/find-support/>