Physics 350 – Renewable Energy Systems
Spring 2018

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Office: OLRI 131 x6627 MWF 1:10 – 2:10 OLRI 100

Introduction

This course provides a detailed treatment of the state-of-the-art science and engineering of electrical power generation by solar and wind and their integration on the grid using energy storage. In the first part of the course general aspects of grid electricity production will be surveyed. The focus of the course will be an in-depth treatment of the physics and engineering of solar cells, wind turbines, and the most promising energy storage options. We will conclude with a discussion of current technical and economic issues associated with the wide scale implementation and integration of these technologies.

Prerequisite and Materials

Mathematics 137 (Single Variable Calculus) or equivalent is the prerequisite. There is no textbook for the class, but there will be numerous handouts throughout the semester. Students are also expected to have high proficiency (or able to develop it) using Excel.

Assignments

Approximately weekly problem sets turned in for grading. You are encouraged to work together on the problem sets. However, each student must submit their own copy of the problem set. There will be one hour examination at mid-term and a final project and presentation of your own choosing (I will make some suggestions and help you vet suitable projects). The project will require a short ~5 page write-up in addition to a power point demonstration to the class.

Evaluation:

Homework: Your problem sets will constitute 40% of your grade.
Exam: The midterm hour exam will count 35% of your grade.
Project: Your final project will count 20 % of your grade (presentation 10% and write-up 10%)
Engagement: Attendance and class participation will count 5% of your grade.

Attendance and Consultation

Since there is no textbook for the course, the material presented in class is your main reference for the homework and the exams. Therefore, *class attendance is mandatory*. Especially as the class evolves over the semester we will begin to focus on more primary literature and class discussion. Unexcused absences will result in a grade penalty.

You are encouraged to see me if you have difficulties with assigned problems or any other aspect of the course. My office hours are posted on my office door, and you may also make an appointment. You may also "drop in" if I am in my office and not busy with another person or on the telephone.

Course Outline
(Note: This schedule is tentative)

Week of	**Class Topic**
1/15	Introduction and Overview
1/22	Energy and Power: General Considerations
1/29	Generators and Electrical Power
2/5	Conventional Energy Production (fossil fuels, nuclear, hydro)
2/12	Wind Energy: Fundamentals and Economics
2/19	Wind Energy: Technical Details
2/26	Solar Energy: Fundamentals and Economics
3/5	Solar Energy: Technical Details **Friday 3/10 Midterm Exam**
3/12	**Spring Break**
3/19	Storage: General Considerations
3/26	Electrochemical Storage and Hydrogen
4/2	Grid Integration of Wind, Solar and Storage: Grid Balance and Capacity
4/9	Grid Integration of Wind, Solar, and Storage: Forecasting, Power Quality, Economics
4/16	Special Topics: Smart Grids, Microgrids, BEV Storage, etc.
4/23	The Future of Energy: Cutting Edge Technologies
4/30	**Monday 4/30 Last day of class**
5/5	**Project Demonstrations:** **Sat 5/5 1:30 – 5:00 pm** **(note extended time)**