

Engineering Fundamentals for Energy Professionals

Vermont Law School Environmental Law Center Summer Session 2010
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Instructor

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Overview

This course provides an intensive introduction to the physics and engineering fundamentals needed to contribute substantially within the energy industry. The course will focus primarily on electrical energy systems with a brief overview of other energy sources. The primary goal of the course is to provide students with an intuitive understanding of the physical principles that are needed for detailed analysis of current issues within the electricity and fossil fuel industries.

Course web site

<http://www.cems.uvm.edu/~phines/classes/vls-energy-a>

Problem sets and reading assignments will be posted on this site. Check the site after each class to get the readings and problem sets.

Background requirements/prerequisites

There are no formal prerequisites for this course, though students should be at least willing to engage in a bit of quantitative analysis. Quantitative problem solving is an important part of the course. Students who have taken a college level physics course will probably have an easier time with the electricity concepts, however this is not a prerequisite.

Course organization and grading

Class periods will include lectures, discussions, short guided problem solving sessions, and even short lab experiment. Students will be organized into groups of ~3 to facilitate problem solving and discussion. Grading will be based upon 3 problem sets, which will include short qualitative essays and quantitative analysis problems, and a comprehensive take-home exam. Students may work in groups on the homework, but not on the exam. The problem sets and exam will be weighted to comprise 25% and 75% of final student grades, respectively. The problem sets will also allow students to provide feedback to the instructor so that unclear concepts can be revisited throughout the course.

Text and readings

Alexandra von Meier. *Electric Power Systems: A Conceptual Introduction* (Wiley, 2006)
BP Statistical Review of World Energy (www.bp.com)
Supplemental readings on current issues as needed.

Schedule

Day 1

Due at the beginning of class:

Read the “BP statistical review of world energy”

Topics:

Fundamental physics of energy

Energy sources (fossil fuels, solar, hydro, geothermal, wind, tidal, etc.)

Energy demand, energy efficiency

Day 2

Due at the beginning of class:

Read “IPCC Climate Change 2007: Summary for Policy Makers”

available from: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf>

Read Von Meier, ch. 1.

Problem set 1

Topics:

Basics of electricity, power plants, emissions, climate change

Day 3

Due at the beginning of class:

Read Von Meier, chs. 2-5

Problem set 2

Topics:

AC and DC electricity

Day 4

Due at the beginning of class:

Read Von Meier, chs. 5-9

Problem set 3

Topics:

Power grid components and systems

Electricity operations and planning

Final exam

The final exam will be posted on the course web site after the final course period. The final is due to the registrar’s office in about two weeks.