Energy Technology and its Environmental Impact

Course number: 11:375:322

Instructor: A.J. Both
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848-932-5730
Office hours: Monday 1-3 pm
Environmental & Natural Resource Sciences Building, room 248

Course web site: http://ecollege.rutgers.edu

Lectures: Tuesday and Thursday 4th period: 14:15 pm - 15:35 pm

Ruth Adams Building, Room 204

Text book: F.M. Vanek, L.D. Albright and L.T. Angenent. 2012. Energy Systems Engineering: Evaluation and Implementation, **2nd Edition**. McGraw Hill Companies, Inc. New York, NY. 640 pp. Additional reading and study materials will be made available through the course web site.

Course description: The purpose of this course is to critically examine the technology of energy systems that will be acceptable in a world faced with global warming, environmental pollution, and declining supplies of oil. The course examines traditional (oil, natural gas, coal), renewable energy sources (solar, wind, biomass), and other non-carbon emitting sources (nuclear) and reduced carbon sources (co-generation, fuel cells). Both devices as well as overall systems will be analyzed.

Learning goals (and their instructional and assessment activities):

1. Acquire knowledge about energy conversion and systems and the related environmental impact (lectures, textbook, handouts) (Matches 375 goal #1)
2. Learn how to perform (engineering) calculations related to energy systems and their environmental impact (homeworks, midterm, final exam) (Matches 375 goal #2)
3. Research and present an energy related topic in class (student classroom presentation) (Matches 375 goal #5)
4. Learn about challenges and opportunities related to energy use and conversion. Learn how to evaluate the sustainability of energy systems (classroom discussions, student synthesis made evident through answers given in class, on homeworks and exams) (Matches 375 goal #7)

Week 1
Lecture 1 Introduction to the Course, Overview of Topics
Lecture 2 Review of Thermodynamics, Complete student presentation signups

Week 2
Lecture 3 Systems Analysis
Lecture 4 Economics

Week 3
Lecture 5 Review of Psychrometrics; **HW 1 due**
Lecture 6 Student presentation 1; Review of Electricity

Week 4
Lecture 7 Climate Change
Lecture 8 Student presentation 2; Combustion Engines

Week 5
Lecture 9 Fossil Fuels; **HW 2 due**
Lecture 10 Student presentation 3; Combined Heat and Power

Week 6
Lecture 11 CO_2 Emissions/Sequestration
Lecture 12 Student presentation 4; Hydro Power

Week 7
Lecture 13 Review and Current Issues; **HW 3 due**
Lecture 14 *Midterm Exam*

Week 8
Lecture 15 Solar Resource
Lecture 16 Student presentation 5; Solar Technologies

Week 9
Lecture 17 Nuclear; **HW 4 due**
Lecture 18 Student presentation 6; Fuel Cells

Week 10
Lecture 19 Wind Energy
Lecture 20 Student presentation 7; Refrigeration and Heat Pumps

Week 11
Lecture 21 Geothermal; **HW 5 due**
Lecture 22 Student presentation 8; Transportation

Week 12
Lecture 23 Greenhouses and Energy
Lecture 24 *No class: Thanksgiving recess*

Week 13
Lecture 25 Biomass Crops; **HW 6 due**
Lecture 26 Biomass Energy

Week 14
Lecture 27 Student presentation 9; Lighting
Lecture 28 Anaerobic Digestion

Week 15
Lecture 29 *Final Exam*; **HW 7 due**

Reading assignments:
Week 1, 2: Chapters 1-3
Week 3, 4: Chapters 4, 6
Week 5, 6: Chapters 5, 7
Week 7, 8: Chapters 9-12
Week 9, 10: Chapters 8, 13
Week 11, 12: Chapters 15, 16
Week 13, 14: Chapters 14, 17

Grading:
The final grade is made up of the following components:

Homework:	30%
Midterm exam:	30%
Final exam	40%

There are eight homework assignments during the semester. Seven are standard problem sets, due on Tuesdays and distributed two weeks in advance (except for the first assignment). Credit will be deducted for late homework (barring legitimate medical or other circumstances) at the rate of 25% per day late, after four days no credit will be given.

Special topics/current events: for the 8th homework grade, students will take turns presenting an energy topic selected from a list of topics provided in class. Presentations (10-15 minutes) are scheduled for the beginning of one of the weekly lectures as indicated above, starting in Week 3. As long as each student presents on the date they signed up for, you will get full credit for this homework.

Classroom participation is strongly encouraged. At the end of the course, a student with good marks for participation who is just below the cutoff for a higher grade can be “bumped up”, at the instructor's discretion.

Please note: The rules described in the University Code of Student Conduct and the Policy on Academic Integrity will apply to all students enrolled in this course. For more information, please visit: http://judicialaffairs.rutgers.edu/