

State University of New York
Department of Electrical and Computer Engineering
EGG250 6 Renewable Energy

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Course Purpose:

Deep concerns regarding the adverse affects that modern (non-renewable) energy resources based on fossil and nuclear fuels have greatly increased public awareness and research activities in renewable energy resources. The existing energy systems pose a great threat to both human health and the natural environment and if measures are not explored and implemented, our lives and the lives of future generations will be in eminent danger. In particular, carbon dioxide and other greenhouse gases will create potentially irreversible changes to the earth's climate in the form of global warming and have a direct impact on our physical well being.

Course Description:

Energy supply from renewable resources as a result of solar power (such as direct solar radiation, and indirect forms such as bioenergy, water and wind power) is studied and analyzed using a technological and scientific approach. Geothermal energy, which is currently classified as the only renewable energy that is independent of the sun is also studied. Nuclear energy and its role in the 21st century (and beyond) and how it fits in with other forms of renewable energy are explored.

The instructor will take a practical approach towards the interdisciplinary subject matter with discussion of real-life applications. Several hands-on experiences and solutions will be explored through the use of modern methods and tools. Experts from local industries will provide guest lectures and opportunities for site visits.

Course Objectives:

Upon completion of the course the student is expected to be proficient in:

1. defining basic concepts/theories of renewable energy
2. applying scientific methods (and their analytic techniques) to renewable energy solutions
3. thinking critically:
 - a. Compare possible solutions to problems and choosing the most appropriate solution based on given constraints.
 - b. Look at social, economic, and environmental impacts of each solution.

Required Textbook:

Renewable Energy, 2nd Edition by Godfrey Boyle, Oxford University Press, 2004.

Supplemental Textbooks:

Renewable Energy Resources, 2nd Edition by John Twidell and Tony Weir, Taylor and Francis Publishing, 2006.

Renewable Energy, 3rd Edition by Bent Sorensen, Elsevier Academic Press, 2004.

Important Websites:

- <http://www.eere.energy.gov>
- <http://www.energy.gov>
- <http://www.nrel.gov>

Prerequisites: College Math

Evaluation:

Homework	20%
Project	20%
Exam 1	20%
Exam 2	20%
Final Exam	20%

Marking System:

A	93-100
A-	90-92
B+	87-89
B	83-86
B-	80-82
C+	77-79
C	73-76
C-	70-72
D+	67-69
D	60-68
F	0-59

Course Outline:

Topics:

1. Introduction to Renewable Energy:
 - a. History and overview of energy systems
 - i. Components
 - ii. Sizing
 - iii. Economics
 - b. Applied sciences - interdisciplinary:
 - i. Physics
 - ii. Chemistry
 - iii. Biology
 - iv. Geology
 - c. Sustainable energy
 - d. Renewable energy
 - i. Comparison of Renewable Energy Sources
 - e. Conservation of Energy
 - i. Cogeneration
 - f. Economics and environmental impact
 - g. Movie with discussion ó òAn Inconvenient Truthö

2. Solar Thermal Energy:
 - a. Solar radiation
 - b. Passive Solar Energy
 - c. Solar Thermal (heating)
 - d. Daylighting
 - e. Electricity generation
 - f. Economics and environmental impact
 - g. Guest Speaker: Architect Richard Librizzi
3. Solar Photovoltaics:
 - a. Semiconductor principles
 - b. PV characteristics
 - c. PV systems
 - i. Off-grid
 - ii. On-grid
 - d. Economics and environmental impact
 - e. Field Trip ó New Paltz Village Hall
 - f. Lab #1
 - g. **Exam #1**
4. Bioenergy:
 - a. Biomass as a fuel
 - b. Bioenergy sources
 - c. Combustion
 - d. Production and gasification
 - e. Liquefying
 - f. Economics and environmental impact
5. Water Energy:
 - a. Hydroelectricity
 - i. Hydro power and turbines
 - ii. Field Trip ó Sturgeon Pool Hydroelectric Facility, Rifton, NY
 - b. Tidal Energy:
 - i. Ocean Thermal Energy Conversion
 - c. Wave Energy:
 - i. Wave motion and patterns
 - ii. Wave energy and power
 - d. Economics and environmental impact
 - e. **Exam #2**
6. Wind Energy:
 - a. Aerodynamics
 - b. Wind turbines
 - c. Economics and environmental impact
7. Geothermal Energy:
 - a. Geophysics
 - b. Conversion of heat
 - c. Ground Source Heat Pumps
 - d. Economics and environmental impact
 - e. Guest Lecturer: TBA

8. Nuclear Energy:
 - a. Renewable?
 - b. Sustainable?
 - c. Economics and environmental impact
 - d. Guest Lecturer: Engineer Paul Bode of Entergy Corp.
9. Hydrogen Fuel Cells:
 - a. Movie with discussion of "Who Killed Electric Car"
10. Integration:
 - a. Energy systems
 - b. Storage
 - c. Transmission
 - d. The effect of decentralizing energy sources

Policies:

- **ADA Policy:** If you have documented disabilities, inform the instructor privately during the first week of class and make proper arrangements. Refer to the Student Handbook for SUNY New Paltz policies.
- **Attendance:** You are expected to attend lectures on a regular basis. In case of absence, it is your responsibility to obtain notes from your fellow classmates, not from the instructor.
- **Missed Coursework:** All coursework is your responsibility. There are no excuses for handing in coursework late. Coursework will be graded as late if not handed in on the due time/date, which is at the beginning of the class period on the due date. Coursework will be penalized one letter grade each day it is late.
- **Rescheduling:** There is no rescheduling unless emergencies arise related to medical or family matters. Rescheduling is contingent on the student presenting both documentation describing the reason(s) for the absence and contact information for the person providing the document(s).
- **Plagiarism:** Submitting material that is not your own work, including internet materials, is considered plagiarism, and will result in a failing mark and a report to the department chair and dean. Quoted material must be correctly cited. Refer to the Student Handbook section on Academic Integrity for a full discussion of policies on plagiarism, cheating, and forgery.