# EK 408 Introduction to Clean Energy Generation and Storage Technologies

Fall 2009

## Course Syllabus

**TEXT BOOK**
Fundamentals of Renewable Energy Processes by Aldo V. DaRosa

**SUPPLEMENTARY REFERENCE**
Sustainable Energy by J. W. Tester, E. M. Drake, M. J. Driscoll, M. W. Golay and W. A. Peters
Other reading materials will be handed out in class

**CLASS SCHEDULE**
Lecture: Classroom PHO 201, Tuesdays and Thursdays 12-2 PM

**INSTRUCTOR** Prof. S. N. Basu (Tel.: 617-353-6728, e-mail: basu@bu.edu)

Office: Room 204, 730 Commonwealth Ave.
Office Hours: Friday 1.00 – 2.00 PM
*Other appointments must be scheduled in advance.*

**GRADING**

| | |
|---|---|
| Midterm | 35 % |
| Final | 35 % |
| Homework | 15 % |
| Project | 15 % |

**EXAMINATIONS**
The course will have a midterm and a final, although the final will NOT be cumulative. Each examination will cover roughly half the course material.

**HOMEWORKS**
There will be 6 homework sets handed out. The homework solutions will be typically due a week from the date they are handed out. Collaborative discussion of the concepts and approach behind the homework questions is allowed; copying the answer from another student is strictly prohibited and will be grounds for disciplinary action.

**PROJECT**

The project will be undertaken by groups of two or three students. The deliverables will include an oral presentation in class (7 points) and a written report (8 points). The group should pick any current clean energy generation or storage technology and address the topics below. Groups with 2 students need only address the first two topics.

**Topic 1**: Overview of the technology chosen, and its advantages and challenges.

**Topic 2**: One major challenge limiting this technology and the current ongoing research to meet this challenge. The science and engineering principles should be clearly laid out.

**Topic 3**: What is its current state of implementation and current and projected market penetration of this technology? Who are the major players?

## LECTURE SCHEDULE

| Class | Day | Month | Date | Year | Comments |
|---|---|---|---|---|---|
| 1 | Thursday | September | 3 | 2009 | |
| 2 | Tuesday | | 8 | 2009 | |
| 3 | Thursday | | 10 | 2009 | |
| 4 | Tuesday | | 15 | 2009 | |
| 5 | Thursday | | 17 | 2009 | |
| 6 | Tuesday | | 22 | 2009 | |
| 7 | Thursday | | 24 | 2009 | |
| 8 | Tuesday | | 29 | 2009 | |
| 9 | Thursday | October | 1 | 2009 | |
| 10 | Tuesday | | 6 | 2009 | |
| 11 | Thursday | | 8 | 2009 | |
| - | Tuesday | | 13 | 2009 | No class (Monday schedule) |
| 12 | Thursday | | 15 | 2009 | |
| 13 | Tuesday | | 29 | 2009 | |
| 14 | Thursday | | 22 | 2009 | **MIDTERM** |
| 15 | Tuesday | | 27 | 2009 | |
| 16 | Thursday | | 29 | 2009 | |
| 17 | Tuesday | November | 3 | 2009 | |
| 18 | Thursday | | 5 | 2009 | |
| 19 | Tuesday | | 10 | 2009 | |
| 20 | Thursday | | 12 | 2009 | |
| 21 | Tuesday | | 17 | 2009 | |
| 22 | Thursday | | 19 | 2009 | |
| 23 | Tuesday | | 24 | 2009 | |
| - | Thursday | | 26 | 2009 | No class (Thanksgiving break) |
| 24 | Tuesday | December | 1 | 2009 | |
| 25 | Thursday | | 3 | 2009 | |
| 26 | Tuesday | | 8 | 2009 | |
| 27 | Thursday | | 10 | 2009 | Project Presentations |
| | ? | | ? | 2009 | **FINALS** (University finals schedule) |

**COURSE TOPICS**

**1. Introduction** **1 week**
Energy resources
Energy utilization
Environmental impact

**2. Fuels** **0.5 week**
Fossil fuels
Nuclear fuels
Biomass

**3. Introduction to thermodynamics** **1 week**
Thermodynamics
Kinetic theory of gases

**4. Thermal Energy Conversion** **2 weeks**
Mechanical heat engines and gas turbines
Ocean thermal energy converters
Alkali metal thermal electricity conversion
Thermoelectricity
Thermoionics

**5. Energy from hydrogen** **2 weeks**
Hydrogen generation technologies
Fuel cells

**6. Energy from the sun** **2 weeks**
Solar radiation and solar collectors
Photovoltaic converters

**7. Nuclear Energy** **0.5 weeks**
Fission and fusion reactors
Fuel cycle

**8. Energy from wind and water** **2 weeks**
Wind energy
Hydroelectric power generation
Ocean engines

**9. Energy storage** **1.5 weeks**
Hydrogen storage technologies
Batteries
Other energy storage technologies

**10. Team project report and presentation** **0.5 weeks**