

EK 408 Introduction to Clean Energy Generation and Storage Technologies

Fall 2019

Course Syllabus

TEXT BOOK

Fundamentals of Renewable Energy Processes, by Aldo V. DaRosa

SUPPLEMENTARY REFERENCES

Sustainable Energy, by J. W. Tester, E. M. Drake, M. J. Driscoll, M. W. Golay and W. A. Peters

Principles of Sustainable Energy, F. Kreith and J.F. Kreider

Renewable Energy and Climate Change, V. Quaschnig

Other reading materials will be handed out in class

CLASS SCHEDULE

Lecture: Classroom ERB 203, Tuesdays and Thursdays, 1.30-3.15 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 – 2 PM

Other appointments must be scheduled in advance.

GRADING AND SCHEDULE

Exam 1	35 %
Exam 2	35 %
Project	30 %

EXAMINATIONS

The course will have two exams. Each exam will cover roughly half the course material. The dates of these exams will be announced in class and homework solutions will be discussed in class before the exams.

HOMEWORKS

Homework sets will be handed out but will not be collected or graded. It is strongly suggested that you try to solve the homework problems independently. Homework solutions will be typically available a week after the homework questions are handed out.

PROJECT

The project will be undertaken by groups of two or three students. The deliverables will include an oral presentation in class (15 points) and a written report (15 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?

COURSE TOPICS

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| 1. Introduction | 1 week |
| Planetary energy resources and utilization | |
| Carbon cycle, photosynthesis, C sequestration | |
| 2. Fuels | 0.5 weeks |
| Fossil fuels | |
| Nuclear fuels | |
| Biofuels | |
| 3. Introduction to fundamental concepts | 1 week |
| Thermodynamics | |
| Kinetic theory of gases | |
| 4. Thermal energy conversion | 1.5 weeks |
| Mechanical heat engines | |
| Gas turbines | |
| Thermoelectric converters | |
| 5. Energy from hydrogen | 2 weeks |
| Fuel cells | |
| Hydrogen generation technologies | |
| 6. Energy storage | 1 week |
| Hydrogen storage technologies | |
| Batteries | |
| Other storage technologies | |

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| 7. Energy from the sun | 2 weeks |
| Solar radiation | |
| Solar collectors | |
| Photovoltaic converters | |
| 8. Energy from wind and water | 1.5 weeks |
| Wind energy | |
| Hydroelectric power generation | |
| Ocean energy | |
| 9. Project presentations | 1 week |