

## ME 533: Energy Conversion

### Instructor

Emily M Ryan

Office: 110 Cummington Mall, Room 416

Email: [ryanem@bu.edu](mailto:ryanem@bu.edu)

Phone: 617-353-7767

**Class Time:** Monday/Wednesday 10:10-11:55AM

**Classroom:** EPIC 206

**Office Hours:** Tuesdays 12:30-1:30PM, or by appointment

### Course Description:

Thermodynamic and mechanical aspects of modern energy conversion systems, including traditional systems such as steam power plants, gas turbines and internal combustion engines and refrigeration systems, and renewable systems such as solar, wind, geothermal. Combined heat and power and cogeneration are also considered, as well as economic and environmental aspects of energy conversion.

### Grading:

Homework	10%
Exam 1	20%
Exam 2	25%
Project	25%
Participation	10%
Discussion Lead	10%

### *Homework*

Homework includes in-class assignments and assigned problem sets and will count for 10% of the final grade. Homework should be turned in during class. Late homework will not be accepted.

Homework assignments should be presented in a professional manner. This includes clean, stapled pages; standard sized notebook or engineering paper; no rough edges; clear, logical work; labeled plots and tables.

### *Exams*

Two exams will be given during the semester. The first will be an in-class exam and will cover material from the first half of the semester. The final exam will be a take home exam.

The final exam will be a report discussing your vision for a sustainable energy future. The report must include citations, calculations to support your vision, a discussion of how your project topic fits (or does not fit) into your vision, and the economic implications of your vision. Details on the report requirements will be given out in class.

All exams are to be done individually. Collaboration of any kind will be grounds for a zero on the exam and possible disciplinary action.

### *Project*

The project will focus on learning about state of the art energy conversion technologies. Individuals or teams of 2 students will work together to research a topic related to a new or advanced energy conversion

technology. Teams will present their technology in class during a mock poster session for the Energy Conversion Conference held mid-semester. Grading will be based on your abstract, poster, presentation and reviews by your fellow classmates. Details on the project will be given in class.

### *Participation*

Participation includes in-class discussions, asking questions in class, attending office hours, answering questions, and generally being present and making an effort.

### *Discussion Lead*

Teams of 2 will choose a short reading (~5-8 pages) relevant to the topic of day and lead a discussion on the reading. The reading should discuss a state of the art technology, societal, environmental or economic aspect of the topic. Readings should not present a review or overview of the topic.

Readings should be selected a week before the class and 2 questions should also be assigned. The questions and a PDF of the selected reading should be emailed to Prof. Ryan one week ahead of class. Readings and questions will be posted on Blackboard.

Note: You must have different partners and topics for the project and the discussion lead.

### **Class Policies:**

1. Academic dishonesty will not be tolerated. Students are expected to follow the BU Code of Student Responsibilities (<http://www.bu.edu/dos/policies/student-responsibilities/>)
2. Cell phone use during class or exams is not allowed. This includes phone calls, texting, browsing, calculator functions, etc.
3. Class begins promptly at 10:10AM. Late arrival is not permitted without prior approval.

### **Course Materials:**

Blackboard will be used for all class communications and documents.

### **Readings:**

Selected articles, reports, and book chapters will be assigned throughout class and are posted to Blackboard.

### **Recommended Textbooks:**

1. J.W. Tester, E.M. Drake, M.J. Driscoll, M.W. Golay, W.A. Peters, *Sustainable Energy: Choosing Among Option*, MIT Press, Second Edition, 2012.
2. K. Weston, *Energy Conversion*, EBook, <http://www.personal.utulsa.edu/~kenneth-weston/>.
3. A.W. Culp, *Principles of Energy Conversion*, McGraw-Hill, 1991.
4. Y.A. Cengel, M.A. Boles, *Thermodynamics*, McGraw-Hill, 2002.

### **Topics:**

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|----------------------------------|---|
| 1. Overview of Energy Conversion | 8. Nuclear Power                          |
| 2. Environmental Impacts         | 9. Wind                                   |
| 3. Thermodynamics Review         | 10. Solar                                 |
| 4. Vapor Power Cycles            | 11. Ocean/Wave Energy                     |
| 5. Gas Power Cycles              | 12. Geothermal                            |
| 6. Cleaning up fossil fuels      | 13. Other Renewable Energy Systems        |
| 7. The Electric Grid             | 14. Direct Chemical-Electrical Conversion |

