

**Advanced Energy Technologies
(ME 4804)
Milwaukee School of Engineering
Spring 2013**

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Required textbook: Principles of Sustainable Energy by Frank Kreith and Jan Kreider

Prerequisite: ME-311 or ME-354 or AE-2121 or MT-3111 or equivalent

Course Description: This course provides a detailed engineering treatment of various emerging energy technologies. Engineering design, thermodynamic performance, environmental impacts and economic considerations are included in the analysis of advanced and sustainable energy systems. Course topics will be chosen from among the following: fuel cells, cogeneration systems, geothermal energy, hydroenergy, nuclear energy, energy from the oceans, smart grid/microgrids, energy storage systems, hybrid energy systems and other transportation options.

Note that renewable energy (wind, solar, and biomass) are covered in another ME technical elective (ME 4805: Renewable Energy Utilization—offered Spring quarters, even years).

Related Program Student Learning Outcomes:

This course addresses student outcomes of the mechanical engineering program by producing graduates who have:

- an ability to apply knowledge of math, engineering, and science.
- an ability to identify, formulate, and solve mechanical engineering problems.
- an ability to communicate effectively.
- a broad education necessary to understand the impact of engineering solutions in a global and societal context.
- knowledge of contemporary issues.

Course Outcomes:

The economics of energy generation and conservation systems is covered at the start of the course, as well as considerations of energy resources and use and environmental implications. Further advanced energy topics will be chosen by the instructor, considering student preferences. Thus, the specific course objectives will be determined after week 1.

Methods of Assessing Student Learning Outcomes: homework assignments, in-class midquarter exam, and a final exam

Letter Grades (This is a rough guideline. Grade determination will be discussed further in class.)

<u>Letter Grade</u>	<u>% Equivalent</u>
A	93-100
AB	87-93
B	80-87
BC	75-80
C	70-75
CD	65-70
D	60-65
F	0-60

Grade Calculation	
Homework assignments and quizzes	30 %
In-class midquarter exam	30 %
Final exam	40 %

Homework:

Homework will be collected periodically during the Thursday class meetings. Each student is required to find, read, and summarize (in 1 or 2 paragraphs) an article in the scientific literature or in the popular press that relates to advanced energy technologies during weeks in which there is NOT another homework assignment due. Students should submit a copy of the article with their synopsis. On occasion, instead of a weekly homework assignment, I will give an announced quiz based on suggested problems/reading and lecture material from the previous few lectures.

Also, you are required to attend two events (symposia, seminars, presentations) outside of class over the course of the quarter. One of the events MUST be from the Sustainability Summit (Delta Airlines Center March 6-7, see <http://www.sustainabilitysummit.us/>). Students will turn in a synopsis of each event with a summary of their impressions. Students who do not attend two outside events will be penalized 50% of their overall homework/quiz grade.

In-Class Exams:

Exams will be closed book/closed notes/closed laptop. You will be allowed one side of an 8.5"x11" sheet of paper for formulas and notes. Calculators are allowed.

A Note Regarding Exam Problems:

ALWAYS circle your answers and ALWAYS express them in the appropriate units! In general, be careful about units and always include them in the answer. Generous partial credit will be given whenever possible so attempt all problems.

Final Exam:

The final exam will be comprehensive. You will be allowed 2 sides of an 8.5"x11" sheet of paper for formulas and notes.

Attendance, Participation and Class Decorum:

Students are expected to attend lectures regularly and to participate fully in class discussions. Attendance in class is to your advantage. I will not take attendance & you will not be penalized for missing class. All information that will be on exams/quizzes will be covered during class. Your level of effort will be used to determine borderline grades. Attendance is a factor in gauging your level of effort.

Regarding Collaboration and Academic Honesty:

You **must** write up your assignments **independently**. You may not examine the finished written work of other students, including those of a previous class. You are expected to conform to the MSOE code for academic honesty. Violation of this policy can result in grades of zero on assignments and/or a grade of *F for the course*. Cheating students will be reported to the Department Head and the VP of Academics. If you cheat you risk *expulsion* from MSOE.

Examples of cheating:

- copying homework
- copying from another student on an exam
- permitting another student to copy from you on an exam or homework assignment,
- copying homework from previous terms
- copying homework from a solutions manual or from previously distributed solutions
- copying a homework solution from a student who is solving the problem for others in a group setting

Bottom line--Any time you represent the work of others as your own you are cheating.

Late Work, Missed Exams:

Homework is due at the beginning of class on the due date. Late homework will not be accepted for credit or graded. A student will receive a zero on exams and quizzes that are missed without a legitimate excuse (e.g. documented illness, family tragedy, etc.).

Course Overview

Introductory/Background Material

- Sustainable energy introduction (Ch 1)
- Energy resources: Estimation and Evaluation (Supplementary material)
- Economics of Energy Generation and Conservation Systems (Ch. 2)

Overview, analysis, design aspects, environmental and economic considerations for some of the following:

Cogeneration (Combined heat and power)

Fuel Cell Systems

Nuclear Energy

Geothermal Energy

Hydroenergy

Energy from the oceans

Hybrid energy systems and transportation options

Energy Storage Systems

I will post a comment/suggestion envelope outside my office. Please let me know what you think about the course. I would particularly like to know how you feel about the pace of the course (too fast, too slow, or about right). *You can have a direct influence on this course while you are taking it!*

In accordance with the American with Disabilities Act requirements, MSOE can accommodate most special needs. Students with a documented physical or learning disability may request accommodation through TRIO or the Learning Resources Center. This request must be made by the end of the 2nd week of the quarter.