

DAI 475—Topics in Design and Industry: Introduction to Solar Energy

Sample Class Syllabus (Subject to Change)—Fall, 2009

Description of Course

A general introduction to solar energy including active, passive and photovoltaic systems. Applications of technology and systems to residential, industrial and consumer electronics markets.

Course Objectives

The course will focus on an understanding of the practical applications of solar energy utilization. A variety of subject matter encompassing concepts from different fields such as architecture and design, physics, geosciences, mathematics engineering and the social sciences will be presented helping students to integrate previously acquired knowledge and experience with new knowledge. Learning activities have been structured so that students can investigate and apply new knowledge toward the identification and possible solution of issues and problems surrounding the solar field.

The learning experiences in this course with the selected topics should enable each student:

1. To be able to identify and explain the difference between active, passive and photovoltaic solar systems.
2. To develop an understanding that solutions to energy-related problems are complex involving sociological, economic, political and technological considerations, decisions and development.
3. To gain insight into the issues surrounding solar energy development and use.
4. To become knowledgeable about applications as they apply to commercial, residential and industrial markets.

The course consists of a series of readings and homework assignments. Some readings are in simple outline format while others are in a more traditional textbook format. In addition, you will frequently be referred online readings and sources of information. The homework assignments and semester project are the heart of the course. You will apply what you have read to prepare analysis and applications. The focus of the assignments will be to gain an understanding of concepts and experience with applying them. You will become more familiar with the terminology of solar energy and be able to express the concepts in that terminology.

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Grading

Grading will depend on four main components:

- Homework Assignments: There will be biweekly essays or reports due on various topics covered in the class. These are a vital component of the course and are an important source of experience and feedback for the student. Homework assignments should be turned in within four weeks after being assigned except for Homework Assignment #1 which should be turned in within one week.
- Testing: There will be a final exam. The final will be comprehensive, and mainly objective -- true or false, etc., with some writing, analyzing, and essay questions.
- Semester Project: An in-depth research or development project on some aspect of the course content. Topic to be approved by instructor.
- Participation: Students are expected to regularly participate in the online forums, asking questions about the materials, discussing class topics and commenting and analyzing relevant current events.

Basis of Grading

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|------------------------|-----|
| • Homework Assignments | 30% |
| • Semester Project | 30% |
| • Final Exam | 20% |
| • Participation | 20% |

Schedule

Topic 1: Social Context of Energy

Readings: Current news articles and other readings as assigned.

Homework Assignment #1: Essay identifying current issues related to energy and climate change.

Topic 2: Introduction to Physical Aspects of Energy

Readings: *Energy Primer* notes and presentation; *Physical History and Economics* pp. 1 to 37.

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Topic 3: Basic Energy Calculations

Readings: *Energy Primer* notes and presentation

Homework Assignment #2: Energy Problem Set (Exercises 1-15 from the Energy Primer)

Topic 4: Characteristics of Solar Radiation

Readings: *The Sun* notes and presentation; other readings as assigned.

Topic 5: Geosciences Considerations and Determinations of Maximum Hypothetical Solar Energy

Readings: *The Solar Potential* notes and presentation; other readings as assigned.

Homework Assignment #3: Solar Problem Set (Exercises 1-5 from *The Sun* and exercises 1-5 from the *Solar Potential*)

Topic 6: Utilization of Passive Solar Energy

Readings: *Passive Solar Energy* notes and presentation; other readings as assigned.

Topic 7: Introduction to Photovoltaic Solar Energy

Readings: *Photovoltaic Solar Energy* presentation and notes-Part I; *Fundamentals of Photovoltaic Materials*; other readings as assigned

Homework Assignment #4: Solar Energy Problem Set (Exercises 1-5 from *Passive Solar Energy*; Exercises 1-5 from *Photovoltaic Solar Energy*)

Topic 8: Photovoltaic Technologies

Readings: *Photovoltaic Solar Energy* presentation and notes-Part II; other readings as assigned

Homework Assignment #5: Solar Energy Problem Set #2 (Exercises 6-10 from *Photovoltaic Solar Energy*)

Topic 9: Direct Current Power Systems

Readings: *Power Systems* and notes-Part I; other readings as assigned.

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Topic 10: Alternating Power Systems and Connecting With “the Grid”

Readings: *Power Systems* and notes-Part II; other readings as assigned.
Homework Assignment #6: Power Systems Problem Set (Exercises 1-10 from *Power Systems*)

Topic 11: Photovoltaic power for mobile consumer devices

Readings: *Photovoltaics for Mobile Applications* notes and presentation-Part I; other readings as assigned.

Topic 12: Photovoltaic power for mobile equipment

Readings: *Photovoltaics for Mobile Applications* notes and presentation-Part II; other readings as assigned.
Homework Assignment #7: Mobile Applications Problem Set (Exercises 1-10 from *Photovoltaics for Mobile Applications*)

Topic 13: Dynamic solar energy

Readings: *Dynamic Solar Power* and notes-Part II; other readings as assigned.
A practice final exam will be given out this week.

Topic 13: Comparison of Solar with Other Forms of Alternative Energy

Readings: current news, other readings as assigned.

Topic 14: Energy and Business Cycle Analysis

Readings: *Physical History and Economics* pp. 38-60; other readings as assigned.
Homework: A practice final exam will be given out this week.

Topic 15: Review and Future Trends and Technologies

Readings: current news articles; other readings as assigned.
Homework: Semester project due.

Topic 16: Final Exam

Homework: the final exam