Florida Atlantic University
Department of Ocean and Mechanical Engineering
Engineering Scholars Program (ESP)

EGN 2935 Applications of Solar Energy (3 credits)

Summer 2014

1. Course Description and Prerequisites

This course covers both solar photovoltaic and solar thermal disciplines. The basic principles are covered and applications ranging from residential to commercial and industrial are treated as design case studies. A basic knowledge of physics is required.

2. Course Objectives (what we will do in this class)

The students will learn the basics of solar energy, how to determine solar intensity, and how to estimate daily and annual solar energy potential at each location. The science and engineering of solar electric and various forms of solar thermal technology are introduced. The students then learn how to apply these principles through a series of practical and hands-on projects. Concepts in thermodynamics, such as conservation of energy, and heat transfer are conveyed through simple experiments with solar hot water collectors. The principles of photovoltaic energy conversion are similarly explained with student participation in solar cell assembly and testing assignments.

3. Course Outcomes (what we expect you to learn)

1. *Solar Radiation Spectrum and the Greenhouse effect*
2. *Solar energy conversion: Thermal, Photovoltaic, Concentrating Solar, and Thermo-photovoltaics*
3. *Photovoltaics: From ingots to wafers to cells, : Crystalline, Multi-Crystalline, Amorphous and thin film*
4. *Solar Thermal: Flat Plate, Vacuum Tubes, Parabolic Trough and Concentric Mirrors*
5. *Solar Thermal Power Plants: Simple and Compound Cycles*
6. *Large Scale Solar PV Plants*
7. *Solar Air conditioning*
8. *Hybrid solar systems*

4. Text Book (if required)

None – Lecture notes will be provided

5. Resources (needed/ to be provided)

A tool kit consisting of a basic multi-meter, thermometers, and assortment of solar cells.
The resources of the Solar Energy Laboratory

6. Grading Scheme

1. Homework Assignments-15%
2. Home experiments-15%
3. Solar project design ideas-10%
4. Group Tests and Laboratory-20%
5. Report Writing-15%
6. Presentation of individual Designs/Projects-25%

7. Course Schedule Details

- Monday, June 9th
  - Morning-Introduction to Renewable Energy in General, Solar in Specific
  - Afternoon-Design and Fabrication of Solar Heating
- Wednesday, June 11th
  - Morning-Solar Spectrum and the Greenhouse Effect
  - Afternoon-Test a Solar Hot Water Panel
- Friday, June 13th
  - Morning-Design of Hot Water Systems
  - Afternoon-Test a Hot Water System
- Monday, June 16th
  - Morning-Basics of Photovoltaics
  - Afternoon-Testing PV Panels
- Wednesday, June 18th
  - Morning-Cells, Modules, Arrays
  - Afternoon-Design a Solar Toy, Make your own cell
- Friday, June 20th
  - Morning-PV Systems
  - Afternoon-Solar Toy and Battery Testing
- Monday, June 23rd
  - Morning-Large Scale PV and Solar Thermal Plants
  - Afternoon-Test of a Combined Hot Water PV Panel
- Wednesday, June 25th
  - Morning-Thermodynamics of Power Generation
  - Afternoon-Design a Solar Concentrator

Friday, June 27th

- Morning-Economics of Solar Energy
- Afternoon-Rap-up and Presentations

8. Submission and Lab Usage Requirements

The students will submit:

3 Research Reports
2 Laboratory Reports
2 Minor and 1 Major Design Reports

9. Instructor and Contact Information

Dr. Amir Abtahi, Dept. of OME, Room 36-109, Email: abtahi@fau.edu

10. Class Dates, Time and Location
MWF: 9:30 AM – 4:30 PM; Location: Lecture (TBA); Laboratory: EG 192 (Solar Laboratory)

For further information: Registered students should use their FAU ID to access the course's Blackboard web page at http://blackboard.fau.edu