COURSE OUTLINE OF RECORD

Number: ENVS G160  TITLE: Solar Energy I--Thermal Technologies And Applications

ORIGINATOR: Marius Cucurny  EFF TERM: Summer 2010
FORMERLY KNOWN AS:  DATE OF OUTLINE/REVIEW: 04-27-2006
CROSS LISTED COURSE: ET G160  TOP NO: 0946.10
SEMESTER UNITS: 4.0
HRS LEC: 72.0  HRS LAB: 0.0  HRS OTHER: 0.0
CONTACT HRS TOTAL: 72.0
STUDY NON-CONTACT HRS RECOMMENDED: 144.0
CATALOG DESCRIPTION:

This course introduces the theoretical concepts and practical applications of solar thermal energy. Solar radiation, measurement, and data processing will be discussed. Components, systems and system performance including design, predicted energy savings, and economics will be examined. The focus will be on low-temperature applications for solar hot water and space heating. Career paths and opportunities within associated industries will be presented.

JUSTIFICATION FOR COURSE:

PREREQUISITES:

COREQUISITES:

ADVISORIES:

ASSIGNED DISCIPLINES:

Engineering technology
Environmental technologies (environmental hazardous material technology, hazardous material abatement, environmentally conscious manufacturing, waste water pretreatment, air pollution control technology, integrated waste management, water treatment, sewage treatment)

MATERIAL FEE: Yes [ ] No [X] Amount: $0.00
CREDIT STATUS: Noncredit [ ] Credit - Degree Applicable [X] Credit - Not Degree Applicable [ ]
GRADING POLICY: Pass/No Pass [X] Standard Letter [X] Not Graded [ ] Satisfactory Progress [ ]
OPEN ENTRY/OPEN EXIT: Yes [ ] No [X]
TRANSFER STATUS: CSU Transferable[X] UC/CSU Transferable[ ] Not Transferable[ ]
BASIC SKILLS STATUS: Yes [ ] No [X]  LEVELS BELOW TRANSFER: Not Applicable
CALIFORNIA CLASSIFICATION CODES: Y - Not Applicable
NON CREDIT COURSE CATEGORY: Y - Not applicable, Credit Course
OCCUPATIONAL (SAM) CODE: C
REPEATABLE ACCORDING TO STATE GUIDELINES: No [X]  Yes [ ] NUMBER REPEATS:
REQUIRED FOR DEGREE OR CERTIFICATE: No [ ] Yes [X]
Associate of Arts: Liberal Arts: Emphasis in Business and Technology(Associate in Arts)
Energy Efficiency and Renewable Energy Degree( Associate in Arts)
Solar Energy(Certificate of Achievement)
Solar Energy Technology(Certificate of Specialization)

GE AND TRANSFER REQUIREMENTS MET:
COURSE LEVEL STUDENT LEARNING OUTCOME(S) Supported by this course:

1. explore career opportunities and paths within the associated industries.
2. understand the safety, environmental, and social impact of solar thermal energy.
3. compare various systems, their applications and performances, and their predicted energy savings and economics.
4. describe the various components of solar thermal systems and their characteristics.
5. understand the fundamental of radiation collection, measurement, and data processing analysis.
6. explain the three basic types of solar/heat transmission

COURSE OBJECTIVES:

1. Explain the three basic types of solar radiation.
2. Understand the fundamentals of radiation collection, measurement, and data processing analysis.
3. Describe the various components of solar thermal systems and their characteristics.
4. Compare various systems, their applications and performances, and their predicted energy savings and economics.
5. Understand the safety, environmental, and social impacts of solar thermal energy use.
6. Explore career opportunities and paths within the associated industries.

COURSE CONTENT:

LECTURE CONTENT:

A. Solar Energy--Thermal Definition as it applies to space and water heating

B. Resource Characteristics / Types of Radiation
   1. Diffuse
   2. Direct Normal
   3. Global

C. Temporal Variations
   1. Diurnal
   2. Seasonal
   3. Interannual

D. Collector Tilt and Orientation

E. Shading and its effect on efficiency of solar radiation collection

F. Collection and Conversion Methods and Efficiencies
   1. Direct Use
   2. Conversion to Mechanical and Electrical Power

G. Concentrating vs. Non-concentrating Solar Collectors
   1. Delivery Temperature
   2. Point Focus vs. Line Focus
   3. Appropriate Applications

H. Energy Storage
   1. Thermal methods
   2. Mechanical methods
   3. Electrical methods

I. Active vs. Passive Systems for solar energy storage
   1. Impact on environment
   2. Physical method of production
   3. Electric energy production versus heating energy
   4. Materials used to fabricate
5. Efficiency
6. Example of uses of each

J. Sun tracking vs. Non-tracking solar collection
1. Efficiency considerations
2. Economic considerations

K. Solar Collecting Applications
1. Water Heating
2. Space Heating
3. Process Heating
4. Air Conditioning
5. Drying
6. Cooking
7. Distillation /Water Purification
8. Pyrolysis
9. Electricity Generation

L. Economics
1. Cost Effective Applications (Typically in Remote Power)
2. Economics for common applications of:
   b. Process Heating to supply heat needed to produce basic materials and commodities

M. Safety and Environmental Impacts
1. Negative impacts
   a. Land Use
   b. Materials Use
2. Positive impacts
   a. Reduced Pollution
   b. Job Creation
   c. Energy Independence

N. Future trends in solar energy collection and storage and career opportunities:
1. Industry
2. Government
3. Commercial
4. Individual

METHODS OF INSTRUCTION:

A. Lecture:
B. Independent Study:

INSTRUCTIONAL TECHNIQUES:

COURSE ASSIGNMENTS:

Reading Assignments
Required readings are from the required text.

Out-of-class Assignments
1. Attendance at topic-related lectures and trade shows as available. 2. Participation in Industry visitations.

Writing Assignments
Homework assignments dealing with topics in the course will require the exercise of all of these
METHODS OF STUDENT EVALUATION:
Final Exam
Short Quizzes
Written Assignments
Report
Projects (ind/group)
Oral Presentations

Demonstration of Critical Thinking:
Problem-based learning activities (define, analyze, synthesize, communicate, report, evaluate) requiring independent research and group collaboration.

Required Writing, Problem Solving, Skills Demonstration:
Homework assignments dealing with topics in the course will require the exercise of all of these skills.

TEXTS, READINGS, AND RESOURCES:
TextBooks:

Other:
1. Handouts from instructors.

LIBRARY:
Adequate library resources include: Non-Print Materials

Comments:

Attachments:
Attached Files