COURSE OUTLINE OF RECORD

Number: ENVS G162
TITLE: Solar Energy II--Photovoltaic Technologies And Applications

ORIGINATOR: Marius Cucurny
EFF TERM: Summer 2010
FORMERLY KNOWN AS:
DATE OF OUTLINE/REVIEW: 03-12-2017
CROSS LISTED COURSE: ET G162
TOP NO: 0946.10
CID:

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 provides a comprehensive introduction to solar photovoltaic (PV) energy systems, including cell design and manufacturing technologies. A range of PV applications will be presented including grid connections, rural electrification, transportation designs, stand-alone systems, consumer products, and the supply of electrical power to satellites in space. 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. demonstrate knowledge of the process for conducting a site assessment and determining available solar resources for a PV installation
3. compare various PV systems, their applications and performances, and their predicted energy savings and economics
4. describe the functions and performance characteristics of each of the components of a photovoltaic power system.
5. explain the principles of solar cell designs and manufacturing technologies.
6. describe the safety, environmental, and social impacts of solar photovoltaic energy use

COURSE OBJECTIVES:

COURSE CONTENT:

LECTURE CONTENT:

A. Solar energy - Photovoltaic Energy
   1. Definition of photovoltaic power

B. Principal Types of Photovoltaic Materials
   1. Single Crystal Silicon
   2. Polycrystalline Silicon
   3. Amorphous Silicon
   4. Other materials Under Development, or in More Limited Use

C. Collection and Conversion Devices and Efficiencies
   1. Photovoltaic Effect Devices
   2. Single Crystal, Polycrystalline, and Amorphous types of silicon devices

D. Optical Concentrating versus Non-concentrating photovoltaic modules

E. Energy Storage
   1. Batteries
   2. Flywheels
   3. Capacitors

F. Tracking vs. Non-tracking photovoltaic modules
   1. Advantages
   2. Disadvantages

G. Photovoltaic Energy Devices as a Modular Technology

H. Systems
   1. PV Arrays
   2. System Component Balance
   3. Support Structures
   4. Inverters
   5. Wiring, Conduit, Connectors
   6. Charge Regulators
   7. Energy Storage (Batteries)
   8. Back-up Generators

I. Applications
   1. Electricity Generation
   2. Remote Applications
   3. Transportation
   4. Consumer Applications

J. Electricity Generation
   1. Residential-scale
   2. Utility-scale
   3. Simple or "Stand-alone" Systems

K. Remote Applications
   1. Rural Electrification / Village Power
2. Communications
3. Water Pumping
4. Grid Support
5. Military equipment
6. Emergency Power Supply
7. Traffic Signals
8. Street and Area Lighting
9. Refrigeration

L. Transportation
1. Ground Transportation
2. Boats
3. Airplanes

M. Consumer Applications
1. Watches, Calculators, Cameras
2. Garden Lights
3. Portable Battery Chargers

N. Benefits
1. Efficiency
2. Reliability
3. Modular nature

O. Economic Comparisons
1. Solar PV
2. On-grid installations
3. Off-grid installations
4. Public Utilities

P. Safety and Environmental Impacts
1. Negative impacts
   a. Land Use
   b. Materials Use
   c. Toxic Waste Generation
   d. Electrical Hazards
   e. Battery-related
   f. Acid Burns
   g. Explosion Hazard
2. Positive impacts
   a. Reduction of Pollution
   b. Job Creation
   c. Energy Independence

Q. Future trends in solar photovoltaic applications

R. Career paths
1. Industry
2. Government
3. Commercial
4. Individual

METHODS OF INSTRUCTION:
A. Lecture:
B. Independent Study:

INSTRUCTIONAL TECHNIQUES:

COURSE ASSIGNMENTS:

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

Reading Assignments
Required readings are from the required text.
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:

Other:
1. Handouts from instructors.

LIBRARY:
Adequate library resources include: Non-Print Materials

Comments:

Attachments:

Attached Files