**COURSE OUTLINE OF RECORD**

**Number:** ENVS G170  **TITLE:** Renewable Energy Sources And Applications

**ORIGINATOR:** Marius Cucurny  **EFF TERM:** Summer 2010

**FORMERLY KNOWN AS:**

**DATE OF OUTLINE/REVIEW:** 05-08-2006

**CROSS LISTED COURSE:** ET G170  **TOP NO:** 0946.10

**SEMESTER UNITS:** 3.0

**HRS LEC:** 54.0  **HRS LAB:** 0.0  **HRS OTHER:** 0.0

**CONTACT HRS TOTAL:** 54.0

**STUDY NON-CONTACT HRS RECOMMENDED:** 108.0

**CATALOG DESCRIPTION:**

This course provides a comprehensive overview of the principal types of renewable energy including solar, thermal, photovoltaic, bio, hydro, tidal, wave, wind, geothermal, hydrogen, and fuel cell. The underlying physical and technological principles of renewable energy resources, their environmental impact, current applications and future prospects will be examined. 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]  **NUMBER REPEATS:**

**REQUIRED FOR DEGREE OR CERTIFICATE:** No [ ] Yes [X]

- Associate of Arts: Liberal Arts: Emphasis in Business and Technology(Associate in Arts)
- Energy Auditor(Certificate of Achievement)
- Energy Efficiency and Renewable Energy Degree(Associate in Arts)
- Solar Energy(Certificate of Achievement)

**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 an awareness of the social, political, economic and environmental issues of renewable energy generation and utilization
3. compare and contrast current renewable energy conversion technologies
4. differentiate between renewable and non-renewable energy sources
5. describe the essential purpose and function of energy and the need for conservation
6. explain the main characteristics and compare the availability of energy forms.

COURSE OBJECTIVES:

1. Explain the main characteristics and compare the availability of energy forms.
2. Describe the essential purpose and function of energy and the need for conservation.
3. Differentiate between renewable and non-renewable energy sources.
4. Compare and contrast current renewable energy conversion technologies.
5. Demonstrate an awareness of the social, political, economic and environmental issues of renewable energy generation and utilization.
6. Explore career opportunities and paths within the associated industries.

COURSE CONTENT:

LECTURE CONTENT:

A. Renewable Energy Introduction
   1. Historical Development of Energy Technology
   2. Present-day Energy Use
   3. Renewable and Non-renewable Energy Sources
   4. Fossil Fuels and Climate Change

B. Solar Energy--Thermal
   1. Characteristics of radiation
   2. Availability of radiation
   3. Types of radiation
   4. Collection and Conversion Methods
   5. Active vs. Passive Systems
   6. Solar thermal energy - such as space heating, water heating, etc.

C. Solar energy--Photovoltaic
   1. Devices utilizing mono-crystalline, Thin Film and other PV Silicon Technologies
   2. Remote Applications
   3. Grid-Connected PV Systems
   4. Examples of solar photovoltaic systems used for electricity generation
      a) industrial
      b) commercial
      c) residential applications,

D. Bioenergy
   1. Bioenergy Past and Present
   2. Bioenergy Sources
   3. Production of Gaseous and Liquid Fuels from Biomass
   4. Bioenergy systems
      a) industrial
      b) commercial
      c) residential applications.

E. Hydroelectricity
1. Hydro-power Principles
2. Propellers and Impulse Turbines
3. Stored Energy and Available Power
4. Examples of hydroelectric installations in the world
   a) Three Gorges Dam
   b) The Grand Coulee
   c) others.

F. Ocean Energy
1. Wave Energy
2. Tidal Power
3. Thermal and Salinity Gradients
4. Applications using Ocean Energy as the energy source using ocean energy:
   a) wave (e.g. oscillating wave tubes)
   b) Tidal Power (e.g. tidal barrages)
   c) Thermal/Salinity (e.g. solar ponds) gradients.

G. Wind Energy
1. Geographical Resources
2. Wind Turbines
3. System Design - Energy Storage
4. Examples of Wind Energy installations
   a) Cape Wind offshore wind park
   b) Arklow Bank offshore wind park

H. Geothermal Energy
1. Geographical Resources
2. Physics of Geothermal Resources
3. Mining of Geothermal Heat
4. Examples of Geothermal Energy installations:
   a) Kilauea
   b) Hawaii Newberry Caldera, Oregon

I. Hydrogen Energy
1. Hydrogen Production/Extraction
2. Conversion Technologies
3. Fuel Cells
4. Examples of hydrogen energy usage
   a) 250 kilowatt Direct Fuel Cell power plant in Peoria, Illinois.

J. Renewable Energy Integration
1. Future Utilization and Availability
2. System Solutions
3. Promoting Renewables
4. Economic, Environmental, Social and Political Impact
5. Career paths associated with renewable energies
   a) System Installation, operation and maintenance
   b) System design and development
   c) Energy efficiency assessment
   d) Energy management

METHODS OF INSTRUCTION:

A. Lecture:
B. Independent Study:

INSTRUCTIONAL TECHNIQUES:
COURSE ASSIGNMENTS:
Reading Assignments
1. 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
1. Homework assignments dealing with topics in the course will require the exercise of all of these skills.

METHODS OF STUDENT EVALUATION:
Final Exam
Short Quizzes
Written Assignments
Report
Projects (ind/group)
Oral Presentations

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

Required Writing, Problem Solving, Skills Demonstration:
1. 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]