

OHLONE COLLEGE
Ohlone Community College District
OFFICIAL COURSE OUTLINE

I. Description of Course:

1. **Department/Course:** ENVS - 104
2. **Title:** Solar Photovoltaic Design and Installation
3. **Cross Reference:**
4. **Units:** 3
Lec Hrs: 2
Lab Hrs: 3
Tot Hrs:
5. **Repeatability:** No
6. **Grade Options:** Grade Only (GR)

7. **Degree/Applicability:**
Credit, Degree Applicable, Transferable
- CSU (T)

8. **General Education:**

9. **Field Trips:** Not Required

10. **Requisites:**

12. Catalog Description:

Introduction of solar photovoltaic system requirements, design and configurations, installation techniques, and their application in residential and commercial construction. Entry-level Certification Exam from NABCEP is an option.

13. Class Schedule Description:

Introduction of solar photovoltaic system requirements, design, and installation.

14. Counselor Information:

Introduction of solar photovoltaic system requirements, design and configurations, installation techniques, and their application in residential and commercial construction. Entry-level Certification Exam from NABCEP is an option.

II. Student Learning Outcomes

The student will:

1. Analyze solar photovoltaic system energy and building resources.
2. Critically assess solar photovoltaic system applications, site evaluation, design analysis, codes and materials, and methods of installation.
3. Investigate solar photovoltaic systems and their relationship with energy conservation, scarce resources and the environment.
4. Compare and contrast solar photovoltaic system energy sources and applications.

III. Course Outline:

A. An overview of Photovoltaics

1. The development of Photovoltaics
2. Photovoltaic system components
3. Photovoltaic system types

B. Photovoltaic Electric Principles

1. Terminology
2. Electrical circuits
3. Series and parallel circuits in power sources and loads

C. The Solar Resource

1. Solar radiation fundamentals
2. Solar site analysis
3. Site data

D. Electric Load Analysis

1. Using energy efficiently
2. Calculating load estimates
3. Electric load analysis

E. Photovoltaic Models

1. Basic Principles
2. Module Performance
3. Mounting Modules

F. Batteries

1. Types and Orientation
2. Specifications
3. Wiring configuration

G. PV Controls

1. Controller Types
2. Controller Features
3. Specifying a Controller

H. Inverters

1. Operating Principles
2. Features
3. Types

I. Photovoltaic System Wiring

1. Wire Size
2. Overcurrent Protection
3. Grounding

J. Sizing Photovoltaic Systems

1. Design and sizing
2. Sizing Worksheets
3. Sample System Exercises

K. Utility-Interactive Systems

1. Introduction and system sizing economics
2. Net Metering
3. Interconnection Agreement

L. Integrating Photovoltaics into Buildings

1. Retrofitted PV Systems
2. BIPV Options
3. Costs/Benefits

M. Photovoltaic System Applications

1. Tools and Appliances
2. Water Pumping
3. Generators

N. Photovoltaic Installation

1. Preparing for Installation
2. Photovoltaic Array Installation
3. PV Installation Final Check List

O. Maintenance and Troubleshooting

1. Materials and Tools List
2. Maintaining Systems
3. Troubleshooting Systems

P. Safety and Installation

1. Basic Safety
2. Safety Equipment
3. Best Practices

IV. **Course Assignments:**

A. Reading Assignments

1. Assigned suggested textbook and non-textbook readings.

B. Projects, Activities, and other Assignments

1. Lab exercises.
2. Class project.

C. Writing Assignments

1. Diagramming solar systems using correct flow-chart symbols and correct electric signs.
2. Keeping a working notebook to record and assess labs and other work performed.

V. **Methods of Evaluation/Assessment:**

- A. Students are assessed through demonstrations of problem solving ability.
- B. Problem solving quizzes and exams.
- C. Practical skill/class performances.

VI. **Methods of Instruction:**

- A. Lecture
- B. Laboratory
- C. Discussion
- D. Demonstration
- E. Audiovisual

VII. **Textbooks:**

Recommended

Supplemental

- A. American Technical Publishers, Inc. *Photovoltaic Systems* First Edition, National Joint Apprenticeship and Training Committee for the Electrical Industry, 2007 ISBN: 978-0-8269-1287
- B. Solar Energy International. *Photovoltaics, Design and Installation Manual* First Edition, New Society Publishers, 2004 ISBN: 0-86571-520-3

VIII. **Supplies:**