

Course Outline of Record

1. Course Code: ESYS-011B
2.
 - a. Long Course Title: Module 2 Residential Solar Surveying and Planning
 - b. Short Course Title: MOD 2 RES-SOLAR-PLAN
3.
 - a. Catalog Course Description:

This course is Module 2 of 3 for students engaged in a solar related field that have a need for knowledge and skills of solar function and design of solar photovoltaics. The coordination between trades, design limitations, and workflow processes will be explained. The fundamental principles and functions of the photovoltaic industry will be introduced. Students will be prepared to work as site planning technicians or solar sales advisors.
 - b. Class Schedule Course Description:

This course is Module 2 of 3 for students interested in a career in the solar industry. The coordination between trades, design limitations, and workflow processes will be explained.
 - c. Semester Cycle (if applicable): N/A
 - d. Name of Approved Program(s):
 - NEW CERTIFICATE IN PROGRESS Certificate of Completion
4. Total Units: 1.00 Total Semester Hrs: 18.00
 Lecture Units: 1 Semester Lecture Hrs: 18.00
 Lab Units: 0 Semester Lab Hrs: 0
 Class Size Maximum: 36 Allow Audit: No
 Repeatability No Repeats Allowed
 Justification 0
5. Prerequisite or Corequisite Courses or Advisories:

Course with requisite(s) and/or advisory is required to complete Content Review Matrix (CCForm I-A)

 Prerequisite: ESYS 311A
6. Textbooks, Required Reading or Software: (List in APA or MLA format.)
 - a. Dunlop, J., P. (2012). Photovoltaic Systems (3rd/e). American Tech Publishers. ISBN: 9781935941057
 College Level: Yes
 Flesch-Kincaid reading level: 11.0
7. Entrance Skills: *Before entering the course students must be able:*
 - a.
Describe history of PV technology and industry
 - ESYS 311A - Describe history of PV technology and industry
 - b.
Describe markets, applications and coordination between disciplines for PV (grid-tie, remote homes, telecom, etc.)
 - ESYS 311A - Describe markets, applications and coordination between disciplines for PV (grid-tie, remote homes, telecom, etc.) SLO (2)
 - c.
Identify types of PV systems (utility-interactive, standalone, direct-coupled, etc.)
 - ESYS 311A - Identify safety hazards of PV systems and state code equipment requirement. SLO (1)
 - d.
Identify safety hazards of PV systems and state code equipment requirement.

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- ESYS 311A - Identify safety hazards of PV systems and state code equipment requirement. SLO (1)

e.

Define basic electrical units and terminology.

- ESYS 311A - Define basic electrical units and terminology SLO (3)

8. Course Content and Scope:

Lecture:

PV Module Fundamentals

- 1.1. Explain how a solar cell converts sunlight into electric power
- 1.2. Have basic knowledge of solar module construction
- 1.3. Identify output values of solar modules by exploring manufacturing availability
- 1.4. Define measurement conditions for solar cells and modules (STC, NOCT, PTC)
- 1.5. Compare the performance and characteristics of various cell materials
- 1.6. Understand efficiency of solar modules

26. System Components

- 2.1. Describe common solar module mounting techniques (ground, roof, pole)
- 2.2. Identify system components (inverter, charge controller, combiner, batteries, etc.)
- 2.3. Describe purpose and operation of system components

3. PV System Sizing

- 3.1. Explain DC system output versus AC production
- 3.2. Analyze load demand calculation methodologies
- 3.3. Identify de-rating factors
- 3.4. Usage of NREL's PV-Watts
- 3.5. Sizing grid-tied versus standalone systems
- 3.6. Explain string inverters versus micro-inverters
- 3.8. Calculate PV Design
- 3.9. Calculate battery storage needs for electrical (EV)

Lab: *(if the "Lab Hours" is greater than zero this is required)*

9. Course Student Learning Outcomes:

1.

Explain and apply NEC Article 690, electrical solar code, to installation specifications.

2.

Describe solar path diagrams and apply during future client interactions e.g. Solar equipment sales, technical installation literature.

3.

Explain to clients how solar cells work and how the efficiency can change solar power productions.

4.

Explain to clients how a proper installation of solar equipment is crucial to power production.

10. Course Objectives: *Upon completion of this course, students will be able to:*

- a. Explain fundamentals of the NEC Article 690 Satisfy SLO 1.
- b. Recognize solar path diagrams & their usefulness. SLO2.
- c. Identify factors that reduce/enhance solar irradiation
- d. Understand the effects of environmental conditions in the solar the industry.
- e. Explain how a solar cell converts sunlight into electricity.SLO3

11. Methods of Instruction: *(Integration: Elements should validate parallel course outline elements)*

- a. Activity
- b. Collaborative/Team
- c. Discussion
- d. Lecture
- e. Participation
- f. Technology-based instruction

12. Assignments: *(List samples of specific activities/assignments students are expected to complete both in and outside of class.)*

In Class Hours: 18.00

Outside Class Hours: 36.00

a. Out-of-class Assignments

- 1. Read assigned text.
- 2. Industry journal entry.
- 3. Assigned worksheets.

b. In-class Assignments

- 1. Review and apply NEC Article 690 by reading and analyzing solar plans and specifications. * SLO(1)
- 2. Draw control diagrams, equipment clearance, battery systems for solar systems.*SLO(2)
- 3. Participate in the discussion and assembly of a common solar panel. SLO (3)

13. Methods of Evaluating Student Progress: *The student will demonstrate proficiency by:*

- True/false/multiple choice examinations
- Student participation/contribution
- Student preparation
- Organizational/timelines assessment

14. Methods of Evaluating: Additional Assessment Information:

15. Need/Purpose/Rationale -- *All courses must meet one or more CCC missions.*

PO - Career and Technical Education

Fulfill the requirements for an entry- level position in their field.

Apply critical thinking skills to execute daily duties in their area of employment.

IO - Scientific Inquiry

Recognize the utility of the scientific method and its application to real life situations and natural phenomena.

16. Comparable Transfer Course

University System	Campus	Course Number	Course Title	Catalog Year
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17. Special Materials and/or Equipment Required of Students:

18. Materials Fees: Required Material?

Material or Item	Cost Per Unit	Total Cost
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19. Provide Reasons for the Substantial Modifications or New Course:

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This course is developed to meet the goals of the California Energy Efficiency Strategic Plan (CEESP) which mandates that 100 percent of all new homes in California will be Zero Net Energy starting in 2020 and 50 percent of commercial buildings

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by 2030. Solar technology is the leading technology used to offset electrical demand from the power grid. California has acknowledged the shortage of qualified and available work force to meet these new mandates. The course is designed to develop the highly trained technical workforce necessary to meet the goals of the California Energy Efficiency Strategic Plan (CEESP).

20. a. Cross-Listed Course (*Enter Course Code*): N/A
b. Replacement Course (*Enter original Course Code*): N/A

21. Grading Method (*choose one*): Letter Grade Only

22. MIS Course Data Elements

- a. Course Control Number [CB00]: N/A
b. T.O.P. Code [CB03]: 94610.00 - Energy Systems Technology
c. Credit Status [CB04]: D - Credit - Degree Applicable
d. Course Transfer Status [CB05]: C = Non-Transferable
e. Basic Skills Status [CB08]: 2N = Not basic skills course
f. Vocational Status [CB09]: Possibly Occupational
g. Course Classification [CB11]: Y - Credit Course
h. Special Class Status [CB13]: N - Not Special
i. Course CAN Code [CB14]: N/A
j. Course Prior to College Level [CB21]: Y = Not Applicable
k. Course Noncredit Category [CB22]: Y - Not Applicable
l. Funding Agency Category [CB23]: Y = Not Applicable
m. Program Status [CB24]: 1 = Program Applicable

Name of Approved Program (*if program-applicable*): NEW CERTIFICATE IN PROGRESS

Attach listings of Degree and/or Certificate Programs showing this course as a required or a restricted elective.)

23. Enrollment - Estimate Enrollment

First Year: 20
Third Year: 40

24. Resources - Faculty - Discipline and Other Qualifications:

- a. Sufficient Faculty Resources: Yes
b. If No, list number of FTE needed to offer this course: N/A

25. Additional Equipment and/or Supplies Needed and Source of Funding.

N/A

26. Additional Construction or Modification of Existing Classroom Space Needed. (*Explain:*)

N/A

27. FOR NEW OR SUBSTANTIALLY MODIFIED COURSES

Library and/or Learning Resources Present in the Collection are Sufficient to Meet the Need of the Students Enrolled in the Course: Yes

28. Originator Ramiro Galicia Origination Date 09/17/16