

Course Outline of Record

1. Course Code: ESYS-011C
2. a. Long Course Title: Module 3 Residential Solar Surveying and Planning  
 b. Short Course Title: MOD 3 RES-SOLAR-PLAN
3. a. Catalog Course Description:  
 This course is Module 3 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 3 of 3 for students interested in a career in the solar industry. Each Module is a stand alone course. 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 311B
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.  
 Explain fundamentals of the NEC Article 690 Satisfy.  
 • ESYS 311B - Explain fundamentals of the NEC Article 690 Satisfy SLO 1.  
b.  
 Recognize solar path diagrams & their usefulness.  
 • ESYS 311B - Recognize solar path diagrams & their usefulness. SLO2.  
c.  
 Identify factors that reduce/enhance solar irradiation.  
 • ESYS 311B - Identify factors that reduce/enhance solar irradiation
8. Course Content and Scope:

Lecture:

**1. 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

**2. 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 efficiency of solar modules to future solar clients and customers.
2.  
Apply National Electrical Code (NEC) solar systems grounding techniques.
3.  
Explain to solar clients the difference between inverters and micro inverters during a solar installation.
4.  
Plan the preliminary design of a single family residential solar systems.

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

- a. Describe efficiency of solar modules. satisfy SLO 1.
- b. Describe common solar module mounting techniques (ground, roof, pole) \* SLO2.
- c. Identify system components (inverter, charge controller, combiner, batteries, etc.)
- d. Explain DC system output versus AC production.
- e. Explain string inverters versus micro-inverters\*SLO3.

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

- a. Activity
- b. Collaborative/Team
- c. Demonstration, Repetition/Practice
- d. Discussion
- e. Lecture

- f. Participation
- g. 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. In-class Assignments

1. Explain solar efficiency and the factors affecting solar performance \* SLO(1)
2. Explain methods for proper electrical grounding.\*SLO(2)
3. Participate in the discussion to identify differences between inverter and micro inverters SLO (3)
4. Evaluate industry tools.

b. Out-of-class Assignments

1. Read assigned text.
2. Assigned worksheets
3. Evaluate energy bill

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

- True/false/multiple choice examinations
- 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.

Display the skills and aptitude necessary to pass certification exams in their field.

Exhibit effective written, oral communication and interpersonal skills.

IO - Scientific Inquiry

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

16. Comparable Transfer Course

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

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18. Materials Fees:  Required Material?

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

This course is Module 3 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.

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 by 2030. Solar technology is the leading technology used to offset electrical demand from the power grid. California has

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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