RENRG 104 Course Outline as of Fall 2020

CATALOG INFORMATION

Dept and Nbr: RENRG 104 Title: GRID TIE RES PV INSTALL
Full Title: Grid Tie Residential Solar PV Installation
Last Reviewed: 11/25/2019

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	2.00	17.5	Lecture Scheduled	35.00
Minimum	3.00	Lab Scheduled	3.00	6	Lab Scheduled	52.50
		Contact DHR	0		Contact DHR	0
		Contact Total	5.00		Contact Total	87.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 70.00 Total Student Learning Hours: 157.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
An intermediate level, integrated lecture-lab class to focus on the installation of residential grid tie solar systems, including technology types, fire codes, permitting, utility interconnection, and ongoing maintenance. This course is intended for students to become solar photovoltaic system installers.

Prerequisites/Corequisites:
Course Completion of RENRG 102 and RENRG 103

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: An intermediate level, integrated lecture-lab class to focus on the installation of residential grid tie solar systems, including technology types, fire codes, permitting, utility interconnection, and ongoing maintenance. This course is intended for students to become solar photovoltaic system installers. (Grade Only)
Prerequisites/Corequisites: Course Completion of RENRG 102 and RENRG 103

Recommended:
Limits on Enrollment:
Transfer Credit:
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**	Effective:	Inactive:
CSU GE:	**Transfer Area**	Effective:	Inactive:
IGETC:	**Transfer Area**	Effective:	Inactive:

CSU Transfer:	Effective:	Inactive:
UC Transfer:	Effective:	Inactive:

CID:

Certificate/Major Applicable:
Certificate Applicable Course

COURSE CONTENT

Student Learning Outcomes:
At the conclusion of this course, the student should be able to:
1. Describe the steps to ensure site safety.
2. Describe best practices for installing solar on different roofing types.
3. Explain the differences between different types of inverters and the benefits and disadvantages of each.
4. Define different conduit types and their use.

Objectives:
At the conclusion of this course, the student should be able to:
1. Discuss issues related to site safety.
2. Review case studies of roof-mounted and ground-mounted solar system installations.
3. Research the differences of inverter types used in the industry for different installation applications.
4. Investigate the physical properties of different materials used for conduits and components and understand their suitability for appropriate use on a solar system installation.
5. Demonstrate proper use of hand tools for a basic solar installation.
6. Assemble a simple racking and module system.

Topics and Scope:

I. Project Preparation
- A. Parts lists and safety equipment
- B. Homeowners associations
- C. Preparing permit package submittals
- D. Permits
- E. Preliminary site meeting

- F. Coordinating with utility company

II. Site Safety
- A. Fire prevention
- B. Ladder safety
- C. Electrical lock-out
- D. Customer safety

III. Equipment Staging
- A. Securing equipment and tools
- B. Maximizing work done on the ground
- C. Benefits of new technologies

IV. Electrical Meters and Sub-Panels
- A. Bus bar ratings for solar
- B. Connections and disconnects
- C. Pull boxes and in-ground boxes

V. System Technologies
- A. Inverter types: string, string with optimizers, micro inverters
- B. Module types: standard, AC modules, stringing
- C. Racking types: rail-based, rail-less, ground mount
- D. Attaching to basic roofing structures
- E. Attaching using basic ground mount systems
- F. Monitoring systems
- G. Rapid shut-down and California Public Utilities Commission Rule 21

VI. Conduit and Wiring Types
- A. Site Conditions
- B. Conduit types: Electrical Metallic Tubing (EMT), PVC, Romex, liquid tight, flex
- C. Voltage drop requirements
- D. Penetrations
- E. Labeling
- F. National Electric Code (NEC) regulations

VII. Solar and Storage
- A. Basic AC and DC coupling
- B. Protected loads panel
- C. Storage with a generator

VIII. Mounting to Structures
- A. On buildings
  1. Fiberglass composition shingle roofs
  2. Tile roofs
  3. Metal roofs
  4. Flat roofs
- B. Ground mounts
  1. Soil types
  2. Single pole or structure
  3. Solar trackers

IX. Install Solar Modules
- A. Safely handling modules
- B. DC string
- C. Micro inverters
- D. AC modules
- E. Cable management

X. Final Commissioning
- A. Visual inspection

B. Mechanical tests
C. Electrical tests
D. Complete project
E. Monitoring systems
F. Customer orientation and turnover documents

XI. Maintenance
A. Preventative maintenance
B. Module cleaning

The above Topics and Scope apply to both lecture and lab course components in an integrated format.

Assignment:

Lecture-Related Assignments:
1. Assigned readings (10-30 pages per week)
2. Problem sets (6-20)
3. Quizzes (5-10)
4. Midterm exam
5. Final exam

Lab-Related Assignments:
1. Weekly lab tasks
2. Tool use demonstrations (5-10)

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments and skill demonstrations are more appropriate for this course.	Writing 0 - 0%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Problem sets and tasks	Problem solving 10 - 40%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Tool use demonstrations	Skill Demonstrations 20 - 50%

Exams: All forms of formal testing, other than skill performance exams.

Quizzes, midterm and final	Exams 30 - 50%

Other: Includes any assessment tools that do not logically fit into the above categories.

Participation	Other Category 0 - 10%

Representative Textbooks and Materials:
Photovoltaic Systems. 3rd ed. Dunlop, James. American Technical Publishers. 2012 (classic)
Instructor prepared materials