Miami Dade College

Course Description

ETP2410C | Design, Installation and Operation of Solar PV Systems | 4.00 credits

This is a required course for all students pursuing a certificate in solar photovoltaic energy generation. The student will learn about solar photovoltaic (PV) systems and the different components comprising the system including: PV panels, controllers and the batteries used with PV systems. The student will learn to size, install, maintain, troubleshoot and repair the PV system through hands-on laboratory experiments utilizing modern testing and simulation equipment. Prerequisite: EET1033C

Course Competencies

Competency 1: The student will demonstrate the ability to describe the concepts associated with renewable solar energy, identify photovoltaic systems and their components by:

1. Describing the pros and cons of solar energy
2. Communicating in solar panel terminology including: maximum power point, open circuit voltage, maximum power volt, system voltage
3. Describing the components of a photovoltaic system
4. Identifying the different types of photovoltaic cells
5. Explaining how a photovoltaic cell works
6. Identifying abbreviations and symbols used on electrical diagrams involving PV systems

Competency 2: The student will demonstrate the ability to describe the characteristics of solar photovoltaic panels and what needs to be done to maximize their output by:

1. Describing the solar panel construction
2. Describing what affects the electricity output of a PV panel
3. Describing how to get the most electricity from a panel
4. Describing how to connect arrays of panels
5. Describing how to connect panels with different characteristics
6. Explaining different ways of mounting panels
7. Specifying the procedures and resources to site a solar array

Competency 3: The student will demonstrate an understanding of the controllers that regulate the flow of electrical energy to and from the battery by:

1. Describing the function and operation of a charge controller
2. Describing the function and operation of a discharge controller
3. Describing the function and operation of combined charge and discharge controllers
4. Describing the installation and maintenance requirements of controllers

Competency 4: The student will demonstrate the ability to specify, install and maintain batteries used with photovoltaic systems by:

1. Listing the special requirements of PV system batteries
2. Identifying the differences between charged battery and an empty one
3. Identifying the need to replace a battery
4. Installing a new battery
5. Conducting battery maintenance and performing equalization as needed
6. Identifying the dangers when working with batteries

Competency 5: The student will demonstrate the ability to calculate and select proper wire size for connecting the PV components by:

1. Calculating the relation between wire size and length to power loss
2. Calculating the voltage drops due to wiring
3. Using the correct type of wire when installing a solar PV system

4. Calculating the load for choosing the correct wire size
5. Making proper wire connections
6. Using wire tables and determining correct wire gauges

Competency 6: The student will demonstrate the ability to calculate and size PV systems by:

1. Calculating electricity losses
2. Estimating the energy output from a solar panel
3. Finding the number of panels needed
4. Adjusting the generation factor for different climates
5. Calculating the battery size
6. Describing the relation between battery life and PV system size
7. Specifying the type and size of the controller unit

Competency 7: The student will demonstrate the ability to plan and install PV systems by:

1. Describing safety issues with typical equipment used on site
2. Recognizing the necessity for fall protection while working from heights
3. Recognizing and correctly following basic electrical safety rules
4. Properly specifying the connection of a solar combiner box
5. Specifying the procedures to lock out and tag out a service panel
6. Making use of various connecting methods including crimp and twist connectors
7. Specifying proper grounding techniques
8. Determine the most efficient location for siting a solar array
9. Describing how to use a Solar Pathfinder
10. Describing how to correctly use a Pyranometer and a Pyrheliometer

Competency 8: The student will demonstrate ability to troubleshoot, repair specify preventive maintenance requirements, procedures and scheduling for PV systems by:

1. Determining the requirements for regular maintenance
2. Specifying the rules for maintenance
3. Specifying special maintenance when replacing the battery
4. Identifying different types of system failures
5. Providing optimum PV system repair solutions

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Describe how natural systems function and recognize the impact of humans on the environment