

Prepared by the Department of Natural Sciences & Life Fitness  
Date of Departmental Approval: March 12, 2012  
Date approved by Curriculum and Programs: September 24, 2012

Effective: Fall 2012

**1. Course Number: ENV178**  
**Course Title: Photovoltaic Installation**

**2. Description:** This course introduces students to the fundamentals of photovoltaic (PV) system installation and maintenance procedures. The class is divided between classroom based lectures/activities and project based activities involving the installation of a residential scale PV system. Students who complete this course are eligible to take the North American Board of Certified Energy Practitioners' Entry Level Certificate of Knowledge of PV Systems Examination (for an additional fee.)

**3. Student Learning Outcomes (instructional objectives; intellectual skills):**

Upon successful completion of this course, students are able to do the following:

- Define basic electrical terms.
- Identify safety hazards associated with the installation, operation, and maintenance of PV systems.
- Calculate simple circuit values and measure them with a multi-meter.
- Identify factors that reduce/enhance PV system performance.
- Identify key output values of solar modules using manufacturer data.
- Label key points on a typical Current and Voltage (IV) curve.
- Compare features and benefits of the most common solar module mounting techniques.
- Describe purpose and operation of main electrical Balance of Systems (BOS) components (inverter, charge controller, combiner, ground fault protection, battery, generator).
- Identify key specifications of main electrical BOS components (inverter, charge controller, combiner, battery, generator).
- Determine series/parallel PV array arrangement based on module and inverter specifications.
- Describe the mechanical loads on a PV array (e.g., wind, snow, seismic).
- Describe typical system design errors.
- Describe typical system performance problems.

**4. Credits:** 3 credits

**5. Satisfies General Education Requirement:** No

**6. Prerequisite:** ENV173

**7. Semester(s) Offered:** Varies

**8. Suggested General Guidelines for Evaluation:** Students are evaluated through home work assignments, quizzes, and project work.

**9. General Topical Outline (Optional):**

**Classroom Topics:**

Review of PV technology, markets, applications, and system types  
Review of solar resource fundamentals  
Electricity Basics  
Safety Basics  
Tools of the Trade  
System Components  
    Modules  
    Inverters  
    Charge Controllers  
    Wiring & Conduit

## Batteries

Mounting Techniques & Mechanical System Design  
Building Code Compliance  
Electrical System Design and Sizing  
Grounding & Lightning Protection  
National Electric Code Compliance  
Off grid systems, Batteries and Battery maintenance  
Maintenance & Troubleshooting

### **Project Topics:**

Installing Racking Mounts  
Mounting Panels on Rack  
Panel & Rack Grounding  
Mounting Electrical Equipment  
Wiring, Electrical Connections, & Grounding\*  
Commissioning  
(\* Actual electrical work must be completed by licensed electrician.)