# **Renewable Energy Solar Option**

## **Program Graduate Competencies**

1. Utilize building system and energy technology hardware and software to gather data on building lighting systems operation and energy consumption.
2. Calculate, analyze, and verify the energy use of buildings based upon the interaction of energy consuming building systems.
3. Evaluate residential buildings and make recommendations for optimized building performance and occupant comfort.
4. Prepare and present technical reports.
5. Analyze the economic, environmental, and business implications of potential energy measures.
6. Perform preliminary and in depth site and customer suitability evaluation of potential applications for solar use.
7. Design and calculate the output of an optimal site-specific array by deriving panel configuration and specifying components.

**NRG 110 – Construction Industry Standards**

**Course Description**

This course will investigate industry standards as applied to modern building construction.

The student will be introduced to OSHA regulations pertinent to the construction industry to

assure safety in the installation of solar photovoltaic and solar thermal systems. Hands-on use

of tools, methods and materials common to light construction will be introduced.

**Core Course Performance Objectives**

1. Demonstrate skills needed to identify hazards in the construction industry and describe the elements of an effective safety plan.

2. Identify and discuss building codes and standards that apply to solar installations.

3. Review common roofing systems in order to identify structural members adequate for system mounting and appropriate penetration techniques.

4. Determine scaffolding, rigging and lifting requirements for solar panels and components.

**NRG 200 – Solar Energy Systems**

**Course Description**

Solar Energy Systems is a course that details the resources and movement of the sun. Students will determine the sun hours for a given location and time. Students will use tools and associated software to properly perform a complete site analysis.

**Course Performance Objectives**

1. Define basic solar energy terminology.
2. Describe the sun’s movement in the sky, and define the solar window for any given latitude or month.
3. Identify factors that reduce or enhance the amount of solar energy collected by a PV array.
4. Quantify the effects of changing orientation on the amount of solar energy received. Utilize instruments and procedures for measuring and calculating solar power and solar energy.
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**NRG 201 – Photovoltaic Systems I**

**Course Description**

Students will learn the fundamentals of PV modules, including how a solar cell converts sunlight into electricity. The system components of a PV system will be discussed, including the role of modules, inverters, and charge controllers. Students will size PV systems for a variety of uses.

**Core Course Performance Objectives**

1. Appraise the photovoltaic market and its applications.
2. Explain the fundamentals of photovoltaic modules.
3. Employ basic system components associated with photovoltaic systems.
4. Design and size photovoltaic systems for use a variety of uses.

**NRG 202 – Photovoltaic Systems II**

**Course Description**

This course covers the design of both the electrical and mechanical systems required in photovoltaic systems. Secondary components required in photovoltaic (PV) systems and how all parts are integrated into the overall system are explored. Troubleshooting and resolving typical problems that can occur when installing PV systems are discussed.

**Core Course Performance Objectives**

1. Design photovoltaic electrical systems.
2. Design photovoltaic mechanical systems.
3. Perform analysis, maintenance, and troubleshooting on PV systems.

**NRG 203 – Concepts of Solar Thermal Design**

**Course Description**

This course introduces the concepts of solar heating design, installation, and operation. Design characteristics, components, operation and maintenance of major components are covered. Site evaluation, codes and regulations, system selection, and planning are emphasized.

**Core Course Performance Objectives**

1. Examine appropriate codes and standards concerning safety, installation, and operation of solar thermal systems and components.
2. Evaluate a site for the installation of a solar thermal system.
3. Design and plan a solar thermal system.
4. Explain the operation and maintenance of a solar thermal system given a set of plans and schematics.

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**NRG 204 – Cooperative Work Experience**

**Course Description**

The Renewable Energy-Solar Cooperative Education course will provide ways for students to increase their awareness of industry expectations, as well as develop job search tools and skills. The content is designed to help students present themselves to employers in a competent and professional manner and to move initially into their Cooperative Education; then into their professional careers. Students will work in a Renewable Energy related Cooperative Education job for a minimum of 144 hours.

**Core Course Performance Objectives**

1. Apply technical skills needed in the solar industry as it relates to the Cooperative Education position.
2. Perform responsibilities as related to proper Renewable Energy-Solar practices as related to the Cooperative Education position.
3. Apply proper care and safety techniques while performing all activities.
4. Apply appropriate aspects of mathematics, science, and environmental disciplines as they relate to their Cooperative Education position.
5. Describe Solar design and management problems as they relate to the specific Cooperative Education position.

## **NRG 207 – NABCEP Prep Class**

**Course Description**

This course is a review for the North American Board of Certified Energy Practitioners (NABCEP) Entry Level Exam.

**Core Course Performance Objectives**

1. Identify common types of PV system applications for both stand-alone and utility interactive systems with and without energy storage.

2. Describe safe practices as delegated by OSHA and the National Electric Code Article 690.

3. Define basic terminology and calculations related to photovoltaics.

4. Perform and describe key photovoltaic design calculations.

5. List and describe the basic types and associated parts of PV systems.

6. Evaluate the basic principles of PV system grounding.