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http://www.arc.losrios.edu/~electron

Certificates: Solar Energy Systems Design, Estimation, and Sales
Solar Energy Technology

North American Board of NABCEP Certified Energy Practitioners®

CERTIFICATES

Solar Energy Systems Design, Estimation, and Sales Certificate

Major Code: 010669C01

This certificate provides training in all aspects of solar photovoltaic (PV) system design, cost estimation, sales, and installation. It also includes training in oral presentations and management skills. The courses included in the certificate also qualify students to take the North American Board of Certified Energy Practitioners (NABCEP) PV Associate Certificate of Knowledge Exam.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- describe the components in a complete grid-tie PV system.
- construct solar PV battery charging systems.
- analyze test equipment data to determine the location of the "sweet spot" on a solar PV panel's Current--Voltage (IV) curves.
- identify tools and test equipment necessary for solar PV panel installations.
- identify different sizes of wire according to American Wire Gauge (AWG) tables.
- describe the advantages of obtaining the NABCEP Associate Certificate of Knowledge Certificate.
- construct a simulated roof system using industry standard building materials.
- calculate the amount of yearly solar radiance in relationship to shading using the Solmetric's SunEye predictor and software.
- inspect and repair malfunctioning components in a functioning grid tie solar PV system.
- estimate the yearly power output for a solar photovoltaic system using both the SunEye and the Pathfinder sun angle and shade predictor.
- identify typical locations of electrical/mechanical failures in PV systems.
- maximize communication effectiveness by specifying, planning for, and adapting to the specific audience.
- identify and analyze factors that contribute to effective design, development, and delivery of presentations.
- relate the communication process to public speaking situations.
- assess the ways to start a business and which form of business organization should be used.
- explain the importance of a business plan, a financial plan, and a marketing plan.
- describe the financing process and how to access capital.
- apply principles of management and marketing relevant to the small business.
- evaluate financial reports.
- analyze the impact of legal requirements and government regulations as related to the operation of the small business.

Career Opportunities

This certificate prepares students for entry level employment in a wide variety of positions in the PV industry. It is also valuable for people working in the PV industry to upgrade their skills to include the newest advancements in solar technology. Career opportunities include PV system designers, PV systems outside sales, PV equipment and associated component sales representatives, and a variety of other emerging careers in this field.

See **losrios.edu/gainful-emp-info/gedt.php?major=010669C01** for Gainful Employment Disclosure.

Requirements for Certificate		20 Units
BUS 350	Small Business Management/Entrepreneurship	3
ENERGY 140	Electrical Applications for Solar Installers	4
ENERGY 141	Electrical & Mechanical Applications for Solar Installers	4
ENERGY 142	NABCEP Associate Certification Preparation	2
ENERGY 143	Solar Photovoltaic Systems Design, Installation, and Troubleshooting	4
SPEECH 301	Public Speaking	3

Solar Energy Technology Certificate

Major Code: 010670C01

This certificate provides training in all aspects of solar photovoltaic (PV) system design, installation, troubleshooting, and repair. The courses included in the certificate also qualify students to take the North American Board of Certified Energy Practitioners (NABCEP) PV Associate Certificate of Knowledge Exam.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- describe the components in a complete grid-tie PV system.
- construct solar PV battery charging systems.
- analyze test equipment data to determine the location of the "sweet spot" on a solar PV panel's Current-Voltage (IV) curves.
- identify tools and test equipment necessary for solar PV panel installations.
- identify different sizes of wire according to American Wire Gauge (AWG) tables.
- analyze and describe the advantages of obtaining the NABCEP Associate Certificate of Knowledge Certificate.
- construct a simulated roof system using industry standard building materials.
- calculate the amount of yearly solar radiance in relationship to shading using the Solmetric's SunEye predictor and software.
- inspect and repair malfunctioning components in a functioning grid-tie solar PV system.
- assess safety hazards in respect to fire, shock, and falls when installing or repairing PV systems.

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(Solar Energy Technology Certificate continued)

- estimate PV system using both the SunEye and the Pathfinder sun angle and shade predictor.
- identify typical locations of electrical/mechanical failures in PV systems.
- calculate the correct gauge wire and number of wires in a metal raceway according to National Electrical Code standards.
- calculate the battery amperage required for a stand-alone PV system.

Career Opportunities

This certificate prepares the student for entry level employment in a wide variety of positions in the PV industry. It is also valuable for people working in the PV industry to upgrade their skills to include the newest advancements in solar technology. Career opportunities include PV installers, PV service technicians, and other emerging careers in this field.

Requirements for Certificate		14 Units
ENERGY 140	Electrical Applications for Solar Installers	4
ENERGY 141	Electrical & Mechanical Applications for Solar Installers	4
ENERGY 142	NABCEP Associate Certification Preparation	2
ENERGY 143	Solar Photovoltaic Systems Design, Installation, and Troubleshooting	4

Energy

ENERGY 140 Electrical Applications for Solar Installers 4 Units

Hours: 54 hours LEC; 54 hours LAB

This is an introductory course in Solar Photovoltaic (PV) energy. It covers how solar PV energy works and how to assess if PV is feasible in a variety of situations. Topics include calculating and measuring PV power outputs for different conditions, using software tools and hardware for calculating and sizing PV systems, and measuring and analyzing shading conditions. Additionally, it addresses how to install and connect necessary components. Field trips may be required.

ENERGY 141 Electrical & Mechanical Applications for Solar Installers 4 Units

Prerequisite: ENERGY 140 with a grade of "C" or better
Hours: 54 hours LEC; 54 hours LAB

This is an advanced course in Solar Photovoltaic (PV) energy. Topics include using hardware and software tools for shading and correctly orientating solar panels, the effect PV panel orientation has on system power output and efficiency, what effect optimum PV panel loading has on power produced, and how to perform a load analysis on a residence. Additionally, it covers the use of various manufacturers' software to calculate PV panel string sizing for optimum efficiency when working with grid-tie inverters. National Electrical Code (NEC) and fire code wire sizing, fusing, and other safety instructions and procedures are stressed. The successful completion of this course and ENERGY 142 qualify students to take the North American Board of Certified Energy Practitioners (NABCEP) Associate Achievement Exam leading to the NABCEP PV Installation Professional Certificate. Field trips may be required.

ENERGY 142 NABCEP Associate Certification Preparation 2 Units

Prerequisite: ENERGY 141 with a grade of "C" or better
Hours: 36 hours LEC

This advanced course in solar photovoltaic (PV) energy includes preparation for the North American Board of Certified Energy Practitioners (NABCEP) PV Associate Certificate of Knowledge Exam. Topics include hardware and software tools used for determining percent of shade and orienting solar panels, the effect of PV panel orientation on system power and efficiency, and the load analysis. Additionally, it covers calculating PV panel string sizing when working with grid tie inverters as related to the NABCEP test. National Electrical Code (NEC) and fire code wire sizing, fusing, and other safety instructions and procedures are reviewed. The successful completion of this course and ENERGY 141 meets the requirements to take the NABCEP certified associate solar PV installers and service technicians entry level certificate of knowledge of PV systems test. Field trips may be required.

ENERGY 143 Solar Photovoltaic Systems Design, Installation, and Troubleshooting 4 Units

Prerequisite: ENERGY 141 with a grade of "C" or better
Hours: 54 hours LEC; 54 hours LAB

This advanced course in solar photovoltaic (PV) energy offers the opportunity for hands-on experience designing, installing, and troubleshooting grid-tie and stand-alone PV systems. Topics include hardware and software tools used in the solar PV industry, blueprint reading, calculating component size and capacity, and personal safety. Additionally, it covers calculating PV panel string sizing when working with grid-tie inverters and battery sizing when designing stand-alone PV systems. National Electrical Code (NEC) and fire code wire sizing, fusing, and other safety instructions and procedures are reviewed. Ten-hour Occupational Safety and Health Administration (OSHA) training is provided. Students must pay the OSHA required fee in order to obtain the OSHA safety card. Field trips may be required.

ENERGY 303 Energy and Sustainability 3 Units

Same As: ET 303 and NATR 303
Advisory: MATH 120, 125, 129, 133 or higher; NATR 300, or an equivalent transferable life science course; and Eligible for ENGRD 310 or ENGRD 312 AND ENGWR 300, OR ESLR 340 AND ESLW 340.
General Education: AA/AS Area IV
Course Transferable to CSU
Hours: 54 hours LEC

This course investigates fundamentals of energy and impacts of energy systems on society and the environment. It explores energy resources, efficiency, conservation, and emerging technologies. Specifically addressed are mechanics, advantages, disadvantages, and sustainability of current and future energy systems. This course also focuses on economic, cultural, political, and environmental aspects of energy production and consumption in the context of the built environment, transportation, food systems, manufacturing, and public services. Field trips may be required. This course is not open to students who have completed NATR 303 or ET 303.