SOLAR ENERGY TECHNICIAN

CERTIFICATE – 16 CREDITS

About this program

The Solar Energy Technician certificate program focuses on preparing students for careers in the photovoltaic and renewable energy field. The program provides a comprehensive view of how solar energy plays a part in the energy delivery grid, and both residential and commercial photovoltaic designs and installation applications. Instruction combines technical theory with hands-on experience in photovoltaic safety, electrical theory and NEC standards, system modules, unit design considerations, performance analysis, maintenance, storage and diagnostic procedures. Graduates of this program are prepared to take the NABCEP Certification Exam and fill positions as solar installation and operations technicians.

Program outcomes

1. Demonstrate occupational safety standards of solar radiation, photovoltaic (PV) technology, and basic electrical concepts related to solar power generation.
2. Read and interpret solar PV system diagrams, electrical schematics, blueprints and installation plans used in residential and small commercial systems.
3. Explain safety practices related to installing and mounting solar panel structures, in terms of wiring, and balance-of-system components according to industry standards.
4. Perform proper electrical connections, grounding and cable management systems in accordance with NEC (National Electrical Codes) and state safety regulations.
5. Use appropriate tools, instruments and procedures to test, troubleshoot and implement solar PV systems to ensure proper PV performance.
6. Diagnose faults and carry out preventive maintenance and repairs on solar photovoltaic systems.
7. Demonstrate professional written communication practices with coworkers, supervisors and clients related to installation and maintenance activities.

Curriculum overview

Crds	Requirement type
10	Required courses
6	Restricted electives in courses
16	**Total**

Developmental courses note: A student may be required to enroll in developmental courses in reading, writing and math. A student's scores on the Accuplacer assessment will determine enrollment in developmental courses. The purpose of developmental courses is to prepare students for the demands of a college-level curriculum. *Credits may vary.*

Accreditation: Minnesota State Community and Technical College is accredited by the Higher Learning Commission, a regional accreditation agency recognized by the U.S. Department of Education. The Higher Learning Commission 230 South LaSalle Street, Suite 7-500 Chicago, IL 60604-1411 http://www.ncahigherlearningcommission.org Phone: 312.263.0456 / 800.621.7440

Curriculum requirement details

Required courses

Course	Crds
SOLR1101 - Basic Photovoltaics	2
SOLR1102 - Photovoltaics Site Assessment	2
SOLR2201 - Photovoltaics System Design I	2
SOLR2202 - Photovoltaics System Design II	2
SOLR2203 - Photovoltaics System Design III	2

Other requirements or restricted electives

3 credits from one or more of these Courses:

Course title	Credits
ELEC1100 - Electrical Safety	1
ELEC1124 - Introduction to Electrical Blueprint Reading	2
ENST2222 - Blueprint Reading for Energy Industry	2

3 credits from one or more of these Courses:

Course title	Credits
BUS1100 - Business Computers	3
BUS1141 - Introduction to Business	3
BUS2204 - Principles of Management	3
BUS2206 - Principles of Marketing	3
COMM1120 - Introduction to Public Speaking	3
COMM1140 - Interpersonal Communication	3
DMKT2200 - Introduction to Digital Marketing	3
ECON2210 - Macroeconomics	3
ECON2222 - Microeconomics	3
ENGL1101 - College Writing	3
MKTG1106 - Professional Selling	3

Course summaries

SOLR1101 - Basic Photovoltaics ..... ***(2 credits)***
This course addresses the basics of solar electricity. Participants learn how photovoltaic (PV) systems work, compare and contrast different PV system types, identify necessary system components, and understand the best applications for (and limitations of) each system type. Other discussion topics include energy efficiency strategies, researching a site's solar potential, and where to find information about PV costs and incentive programs.

SOLR1102 - Photovoltaics Site Assessment ..... ***(2 credits)***
This course uses presentations, exercises, activities and classroom discussion to demonstrate how to perform a residential photovoltaics (PV) site assessment, using a template created by the MREA (Midwest Renewable Energy Association). Topics covered include load analysis and consumption history, energy efficiency recommendations, mounting options, balance of system location requirements, shade analysis, system sizing, financial analysis and options, and non-financial benefits of PV. Participants learn how to access and use online tools for assessing the solar resource, perform site-specific shade analysis, recommend system size and location, calculate energy production, estimate system costs, and identify available PV rebates and incentives.

Prerequisites:

- SOLR1101

SOLR2201 - Photovoltaics System Design I ..... ***(2 credits)***
This course introduces the step-by-step process of designing a photovoltaic (PV) system. Participants learn about electrical and solar characteristics, system sizing strategies based on multiple variables, how to select appropriate equipment for each system type, and how to analyze site assessment data as part of the design process.

Prerequisites:

- SOLR1101
- SOLR1102

SOLR2202 - Photovoltaics System Design II ..... ***(2 credits)***
This course provides instruction on electrical distribution and storage systems associated with a photovoltaic array. Topics covered include battery types and characteristics, charge controllers and inverters.

Prerequisites:

- SOLR2201

SOLR2203 - Photovoltaics System Design III ..... ***(2 credits)***
This course provides further instruction on planning and constructing the physical layout of a photovoltaic (PV) array, choosing a mounting method, and applying relevant building and electrical code requirements. This course also prepares students to take the North American Board of Certified Energy Practitioners (NABCEP) PV Associate Exam or any entry-level exam in photovoltaics.

Prerequisites:

- SOLR2202

ELEC1100 - Electrical Safety ..... ***(1 credits)***
This course provides students with an understanding of occupational safety practices and requirements associated with working in the electrical industry. It also covers the purpose and enforcement of general safety rules.

ELEC1124 - Introduction to Electrical Blueprint Reading ..... ***(2 credits)***
This course provides the student with a working knowledge of residential blueprints and specifications. The student gains an understanding of blueprints, then interprets and applies this knowledge to the electrical industry.

ENST2222 - Blueprint Reading for Energy Industry ..... ***(2 credits)***
This course will introduce students to reading and interpreting system and strand maps for the gas, electric and communication industry. Students will also be introduced to reading building blueprints and staking and pole framing sheets.

BUS1100 - Business Computers ..... ***(3 credits)***
Students will utilize business computer software applications including word processing, spreadsheets, databases and presentation software to solve business problems, emphasizing professional design and organization. Additional topics include basic computer hardware, computer security and ethics, privacy concerns and professional communication standards.

BUS1141 - Introduction to Business ..... ***(3 credits)***
Whether Business majors or simply curious about the field, students in this course examine how businesses operate in today's global economy and how various roles contribute to organizational success. Special emphasis is placed on career discovery, with students identifying potential professional interests and aligning their interests with business functions. Students explore current trends, ethical considerations and the impact of technology on business practices while also learning about the skills and qualifications needed for business careers.

BUS2204 - Principles of Management ..... ***(3 credits)***
This course examines the historical and philosophical foundations of management as well as current theory and practices. Managerial decisions as a planner, organizer, motivator, controller and leader of a diverse workforce in a competitive environment are identified and evaluated. The course is a study of the basic principles of business management, including the functional, scientific, behavioral and systems approaches along with the role of projects in contemporary organizations. Current literature, concepts, models and applications may be included as well as the use of case studies.

BUS2206 - Principles of Marketing ..... ***(3 credits)***
This course examines the business function of marketing and will enhance students' decision-making skills in a global market. The course focuses on how marketers create value by satisfying customer needs and wants by analyzing which target markets the organization can best serve, and the appropriate strategies to serve these markets. This course will also discuss the implications of environmental factors (including the digital environment) that can impact the marketing strategies of a business. Topics include business and consumer markets, branding and product strategies, marketing research, digital marketing concepts, pricing, promotion and supply chain management.

COMM1120 - Introduction to Public Speaking ..... ***(3 credits)***
Meets MnTC Goal Area 1. This course clarifies the process of oral communication, clarifies the basic principles of public speaking and allows the student to increase the application of these principles while both speaking and listening.

COMM1140 - Interpersonal Communication ..... ***(3 credits)***
Meets MnTC Goal Area 1. This course will focus on improving students' abilities to communicate effectively in one-to-one dyadic encounters by providing experience-based instruction. Extensive in-class and out-of-class analyses allow the student to examine his/her own and others' informal social interactions. The long-term goal is for the student to apply interpersonal communication theories to daily interactions and draw his/her own conclusions about the effectiveness of interpersonal communication.

DMKT2200 - Introduction to Digital Marketing ..... ***(3 credits)***
This course provides a broad overview of the digital marketing techniques needed for successful marketing campaigns in a digital economy. Students will gain a fundamental understanding of the digital marketing core principles needed for the 21st century consumer. Topics will include webpage design, analytics, search engine optimization (SEO), pay-per-click, email marketing, social media marketing and mobile marketing. This class prepares students for more advanced digital marketing courses.

ECON2210 - Macroeconomics ..... ***(3 credits)***
This course provides the student with a means to study economic principles as they relate to determinants of national income, national income accounting, business cycles, unemployment, inflation and aggregate expenditures. The course also examines macroeconomic policy and provides information to gain further understanding in the areas of fiscal policy, financial markets, money and banking, monetary policy, international policy and the varying viewpoints that have evolved throughout history, including the Keynesian and Monetarist schools of thought.

ECON2222 - Microeconomics ..... ***(3 credits)***
Microeconomics stresses the concepts of scarcity, production possibilities, supply and demand curves, elastic and inelastic goods and services, competition, monopolies, oligopolies, poverty and income distribution in the United States. In general, microeconomics examines the functioning of individual industries and the behavior of the individual.

ENGL1101 - College Writing ..... ***(3 credits)***
Meets MnTC Goal Area 1. This is an introductory course designed to prepare students for later college and career writing through a process approach with particular emphasis on revision. Students consider purpose and audience as they read, discuss and refine their work to develop confidence in their writing and communication skills.

MKTG1106 - Professional Selling ..... ***(3 credits)***
This course covers a fundamental sales approach that can be used as a foundation for future sales courses. The content covers steps used to plan a sales presentation and methods of determining and filling prospect needs or wants.

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Program Plan — "Solar Energy Technician - Certificate"

Locations: Fergus Falls

1st Fall Term (7 credits)

Courses

Course	Crds
SOLR1101 - Basic Photovoltaics	2
SOLR1102 - Photovoltaics Site Assessment	2

3 credits in one or more of the following:

- ELEC1100 - Electrical Safety 1
- ELEC1124 - Introduction to Electrical Blueprint Reading 2
- ENST2222 - Blueprint Reading for Energy Industry 2

1st Spring Term (9 credits)

Courses

Course	Crds
SOLR2201 - Photovoltaics System Design I	2
SOLR2202 - Photovoltaics System Design II	2
SOLR2203 - Photovoltaics System Design III	2

3 credits in one or more of the following:

- BUS1100 - Business Computers 3
- BUS1141 - Introduction to Business 3
- BUS2204 - Principles of Management 3
- BUS2206 - Principles of Marketing 3
- COMM1120 - Introduction to Public Speaking 3
- COMM1140 - Interpersonal Communication 3
- DMKT2200 - Introduction to Digital Marketing 3
- ECON2210 - Macroeconomics 3
- ECON2222 - Microeconomics 3
- ENGL1101 - College Writing 3
- MKTG1106 - Professional Selling 3