NEOSHO COUNTY COMMUNITY COLLEGE
MASTER COURSE SYLLABUS

COURSE IDENTIFICATION

Course Code/Number: SUST 106
Course Title: Photovoltaic System Installation

Division: □ Applied Science (AS) □ Liberal Arts (LA) □ Workforce Development (WD)
□ Health Care (HC) □ Lifetime Learning (LL) □ Nursing □ Developmental

Credit Hour(s): Three (3)
Effective Date: SP2009/Fall2013
Assessment Goal Per Outcome: 70%

COURSE DESCRIPTION

This course is a continuation of SUST 104. It covers the unique differences between grid intertie and off-grid systems and associated components. Students will use the National Electrical Code (NEC) as it relates to photovoltaic (PV) installation. Safety on the job will be emphasized.

MINIMUM REQUIREMENTS/PREREQUISITES AND/OR COREQUISITES

SUST 104 Photovoltaic Systems

TEXTS

The official list of textbooks and materials for this course is found on Inside NC.

http://www.neosho.edu/ProspectiveStudents/Registration/CourseSyllabi.aspx

GENERAL EDUCATION OUTCOMES

1. Practice Responsible Citizenship through:
   • identifying rights and responsibilities of citizenship,
   • identifying how human values and perceptions affect and are affected by social diversity,
   • identifying and interpreting artistic expression.
2. Live a healthy lifestyle (physical, intellectual, social) through:
   - listing factors associated with a healthy lifestyle and lifetime fitness,
   - identifying the importance of lifetime learning,
   - demonstrating self-discipline, respect for others, and the ability to work collaboratively as a team.

3. Communicate effectively through:
   - developing effective written communication skills,
   - developing effective oral communication and listening skills.

4. Think analytically through:
   - utilizing quantitative information in problem solving,
   - utilizing the principles of systematic inquiry,
   - utilizing various information resources including technology for research and data collection.

COURSE OUTCOMES/COMPETENCIES (as Required)

Note: Course Outcomes/Competencies are taken directly from the North American Board of Certified Energy Practitioners Technical Committee Document Approved April 11, 2005. Upon completion of the course students will demonstrate the ability to:

I. Adapt the electrical design.
   a. In adapting a PV system electrical design, the practitioner shall be able to:
      i. Determine the design currents for any part of a PV system electrical circuit
      ii. Select appropriate conductor types and ratings for each electrical circuit in the system based on application
      iii. Determine the derated ampacity of system conductors, and select appropriate sizes based on design currents
      iv. Determine appropriate size, ratings and locations for all system overcurrent and disconnect devices
      v. Determine appropriate size, ratings and locations for grounding, surge suppression and associated equipment
      vi. Determine voltage drop for any electrical circuit based on size and length of conductors
      vii. Verify that the array operating voltage range is within acceptable operating limits for power conditioning equipment, including inverters and controllers
      viii. Select an appropriate utility interconnection point, and determine the size, ratings and locations for overcurrent and disconnect devices

II. Install subsystems and components at the site.
   a. As part of the PV system installation process, the practitioner shall be able to:
      i. Utilize drawings, schematics, instructions and recommended procedures in installing equipment
      ii. Implement all applicable personnel safety and environmental protection measures
      iii. Visually inspect and quick test PV modules
      iv. Assemble modules, panels and support structures as specified by module manufacturer or design
      v. Install module array interconnect wiring, implement measures to disable array during installation
vi. Complete final assembly, structural attachment and weather sealing of array to building or other support mechanism
vii. Install and provide required labels on inverters, controls, disconnects and overcurrent devices, surge suppression and grounding equipment, junction boxes, batteries and enclosures, conduit and other electrical hardware
viii. Label, install and terminate electrical wiring; verify proper connections, voltages and phase/polarity relationships
ix. Verify continuity and measure impedance of grounding system
x. Program, adjust and/or configure inverters and controls for desired set points and operating modes

III. Perform a system checkout and inspection.
   a. After completing the installation of a PV system, as part of system commissioning, inspections and handoff to the owner/operator, the practitioner shall be able to:
      i. Visually inspect entire installation, identifying and resolving any deficiencies in materials or workmanship
      ii. Check system mechanical installation for structural integrity and weather sealing
      iii. Check electrical installation for proper wiring practice, polarity, grounding and integrity of terminations
      iv. Activate system and verify overall system functionality and performance, compare with expectations
      v. Demonstrate procedure for connecting and disconnecting the system and equipment from all sources
      vi. Identify and verify all required markings and labels for the system and equipment
      vii. Identify and explain all safety issues associated with operation and maintenance of system
      viii. Identify what documentation is required to be provided to the PV system owner/operator by the installer

MINIMUM COURSE CONTENT

The following topics must be included in this course. Additional topics may also be included.

I. Adapt the electrical design.
II. Install subsystems and components at the site.
III. Perform a system checkout and inspection.

STUDENT REQUIREMENTS AND METHOD OF EVALUATION

INSTRUCTIONAL METHODS

1. Lecture
2. Audio-Visual aids
3. Example and demonstration
4. Skills tests (performance-based)
STUDENT REQUIREMENTS

Evaluation of student performance is determined primarily from results of skills tests to validate mastery of course competencies.

GRADING SCALE

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<thead>
<tr>
<th>Percentage</th>
<th>Grade</th>
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<tbody>
<tr>
<td>90-100 %</td>
<td>A</td>
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<td>80-89 %</td>
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<tr>
<td>70-79 %</td>
<td>C</td>
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<td>60-69 %</td>
<td>D</td>
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<tr>
<td>0-59 %</td>
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ASSESSMENT OF STUDENT GAIN

The purpose of assessing student learning at Neosho County Community College is to ensure the educational purposes of the institution are met and appropriate changes are made in program development and classroom instruction to allow for student success. The instructor(s) of this course will determine the methods of assessment most appropriate and complete an assessment report at the end of the course.

Students will be assessed through skill demonstration. Comparison from beginning to end of class will determine the extent of student gain.

Attendance Policy

1. NCCC values interactive learning which promotes student engagement in the learning process. To be actively engaged, the student must be present in the learning environment.

2. Unless students are participating in a school activity or are excused by the instructor, they are expected to attend class. If a student’s absences exceed one-eighth of the total course duration, (which equates to one hundred (100) minutes per credit hour in a face-to-face class) the instructor has the right, but is not required, to withdraw a student from the course. Once the student has been dropped for excessive absences, the registrar’s office will send a letter to the student, stating that he or she has been dropped. A student may petition the chief academic officer for reinstatement by submitting a letter stating valid reasons for the absences within one week of the registrar’s notification. If the student is reinstated into the class, the instructor and the registrar will be notified. Please refer to the Student Handbook/Academic Policies for more information.

3. Absences that occur due to students participating in official college activities are excused except in those cases where outside bodies, such as the State Board of Nursing, have requirements for minimum class minutes for each student. Students who are excused will be given reasonable opportunity to make up any missed work or receive substitute assignments from the instructor and should not be penalized for the absence. Proper procedure should be followed in notifying faculty in
advance of the student’s planned participation in the event. Ultimately it is the student’s responsibility to notify the instructor in advance of the planned absence.

ACADEMIC INTEGRITY

NCCC expects every student to demonstrate ethical behavior with regard to academic pursuits. Academic integrity in coursework is a specific requirement. Definitions, examples, and possible consequences for violations of Academic Integrity, as well as the appeals process, can be found in the College Catalog, Student Handbook, and/or Code of Student Conduct and Discipline.

ELECTRONIC DEVICE POLICY

Student cell phones and other personal electronic devices not being used for class activities must not be accessed during class times unless the instructor chooses to waive this policy.

NOTE:
Information and statements in this document are subject to change at the discretion of NCCC. Students will be notified of changes and where to find the most current approved documents.

NOTE:
If you are a student with a disability who may need accommodation(s) under the Americans with Disabilities Act (ADA), please notify studentdevelopmentteam@neosho.edu, Chanute Campus, 620-431-2820, ext. 213., or Ottawa Campus, 785-242-2067 ext. 305, as soon as possible. You will need to bring your documentation for review in order to determine reasonable accommodations, and then we can assist you in arranging any necessary accommodations.

COURSE NOTES