PELLISSIPPI STATE COMMUNITY COLLEGE
MASTER SYLLABUS

ALTERNATIVE ENERGY CONVERSIONS
EET 2940

Class Hours: 1 Credit Hours: 2

Laboratory Hours: 3 Date Revised: Spring 2017

Catalog Course Description

This course provides an introduction to a variety of residential and commercial distributed generation technologies, with an emphasis on photovoltaic systems. Topics include basic understanding of direct current and alternating current systems, electrical generation techniques, load assessment, system sizing, system installation, and technology applications. The course covers on-grid and off-grid systems. In addition, the course introduces the student to other alternative energy conversion techniques, such as wind technology, fuel cells and others.

Prerequisites

EET 1012 or consent of instructor

Corequisites

None

Textbook(s) and Other Course Materials

Textbook: Photovoltaic Systems, Jim Dunlop. Latest Edition. Delmar Publishing.

Reference: Essentials of Distributed Generation Systems, Gregory Massey, Jones & Bartlett Publishers

Week/Unit/Topic Basis

Week Topic

1. Introduction to Power Systems: Generation, Transmission, Disribution
2. Overview of Energy Alternatives & Distributed Generation
3. DC/AC Circuits Review
4. AC Systems
5. AC Generation Principles
6. Introduction to Photovoltaic Systems
7. System Components and Configurations
8. Photovoltaic Cells & Arrays
9. Batteries, Chargers &Inverters

10. Load Analysis & System Sizing
11. Co-generation: Wind Technology
12. Co-generation: Fuel Cell Technology
13. Co-generation: Other Technology options
14. Cost Benefit Analysis
15. Final Exam

Engineering Technology General Outcomes (Educational objectives)

I. Apply basic engineering theories and concepts creatively to analyze and solve technical problems

II. Utilize with a high degree of knowledge and skill equipment, instruments, software, and technical reference materials currently used in industry.

III. Communicate effectively using developed writing, speaking, and graphics skills.

IV. Assimilate and practice the concepts and principles of working in a team environment.

V. Obtain employment within the discipline or matriculate to a four year program in engineering or industrial technology

Engineering Technology Concentration Competencies

NOTE: At the program level all 6 competencies apply to roman numerals I – V of the Engineering Technology General Outcomes (Educational objectives) listed above.

Students will

A. Apply the knowledge, techniques, skills, and modern tools for the concentration of study to specifically defined engineering technology activities

B. Demonstrate the knowledge of mathematics, science, engineering and technology to engineering technology problems using developed practical knowledge

C. Conduct and report the results of standard tests and measurements, and conduct, analyze and interpret experiment or project results

D. Function effectively as a member of a technical team

E. Identify, analyze and solve specifically defined engineering technology-based problems

F. Employ Written, oral and visual communication in a technical environment

Course Goals

NOTE: Capital letters after course goals reference the competencies of the Engineering Technology concentrations listed above.

The course will

1. Enhance student understanding of basic electricity. (A, B, C, E)
2. Enhance student understanding of basic units of electricity. (A, B, C, E)
3. Enhance student understanding of the generation, transmission, and distribution of electricity. (A, B, C, E)
4. Enhance student understanding of the electrical generation principles. (A, B, C, E)
5. Enhance student understanding of the distributed generation principles. (A, B, C, E)
6. Enhance student understanding of solar concepts. (A, B, C, E)
7. Enhance student understanding of sizing a Photovoltaic system. (A, B, C, E)
8. Enhance student understanding of the difference between on-grid and off-grid systems. (A, B, C, E)
9. Enhance student understanding of fundamentals of various co-generation techniques. (A, B, C, E)
10. Enhance student understanding of application safety risks when working with residential power generation. (A, B, C, E)
11. Expand student experience in applying, as an individual and as a team member, information skills, problem-solving skills, project execution skills, and communication skills. (D, E, F)

Expected Student Learning Outcomes

NOTE: Numbers after Expected Student Learning Outcomes reference the course goals listed above.

The student will

a. Explain the theory of electricity. (1, 2)
b. Explain the basic terminology and units of electricity (1, 2)
c. Explain and apply basic electrical equations. (1, 2)
d. Explain the characteristics of series and parallel circuits. (1)
e. Define AC & DC power and typical sources of each. (1)
f. Define the principle of "electromagnetic induction". (1)
g. Explain the structure of a single phase alternating current system. (1, 3, 4, 6, 7, 9, 10)
h. Explain the principles of transformer operation. (1, 3)
i. Identify the methods of energy conversion. (1, 3, 4, 5, 6, 7, 9)
j. Understand solar behavior and how solar energy can be harnessed. (5)
k. Explain the components of a solar photo-voltaic power generation system. (5, 6, 7)
l. Explain on-grid and off-grid principles. (7)
m. Understand the technical specifications for PV modules: Open circuit voltage, short circuit current, maximum power voltage, maximum power current, etc… (4, 5, 6, 7)
n. Understand the temperature effects on PV module's electrical parameters. (4, 5, 6, 7)
o. Perform a site assessment for a solar PV system. (4, 5, 6, 7)
p. Understand shading effects on PV systems. (6, 7)

q. Understand the application of single phase residential power systems. (1, 3, 4, 6, 7, 8, 9, 10)
r. Identify the different utilization voltages for residential and commercial power systems. (1, 3, 4, 6, 7, 8, 9, 10)
s. Perform a load assessment for a Photo-Voltaic system. (6)
t. Explain the advantages and disadvantages of wind power. (10)
u. Identify areas that are ideal for wind generation. (10)
v. Perform online research for PV equipment. (11)
w. Complete a PV project design. (11)

Evaluation

Testing Procedures: 80% of grade

Chapter Tests	40%
Quizzes&Homework	20%
Final Exam	20%

Laboratory Expectations: 10% of grade

The laboratories for all EET courses are an essential part of conveying the concepts to the student. The labs would closely follow the classes in content and in time of presentation so that the student is actually verifying these concepts to his or her self. The student will be able to apply the theory learned in class. The laboratory grade will be determined by a combination of performance within the lab and the quality and demonstrated comprehension of the lab report. There will be at least twelve labs during the semester to go along with the classroom material.

Field Work:

None

Other Evaluation Methods: Project (10%)

Students will complete an assigned project for the course. Each student will provide a laboratory report on the project. The report shall include:

Title Page
Project Description
Sun chart (s)
Calculations
Block Diagram Schematic
Bill of Material

Grading Scale:

93 – 100	A
88 - 92	B+
83 - 87	B
78 - 82	C+
70 – 77	C
60 - 69	D
0 - 59	F

Policies

Attendance Policy

Pellissippi State expects students to attend all scheduled instructional activities. As a minimum, students in all courses (excluding distance learning courses) must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of Academic Affairs, may have requirements that are more stringent. In very specific circumstances, an appeal of the policy may be addressed to the head of the department in which the course was taken. If further action is warranted, the appeal may be addressed to the vice president of Academic Affairs.

Academic Dishonesty

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to the following practices:

- Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.
- Plagiarism, including but not limited to paraphrasing, summarizing, or directly quoting published or unpublished work of another person, including online or computerized services, without proper documentation of the original source.
- Purchasing or otherwise obtaining prewritten essays, research papers, or materials prepared by another person or agency that sells term papers or other academic materials to be presented as one's own work.
- Taking an exam for another student.
- Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor.
- Any of the above occurring within the Web or distance learning environment.

Please see the Pellissippi State Policies and Procedures Manual, Policy 04:02:00 Academic/Classroom Conduct and Disciplinary Sanctions for the complete policy.

Accommodations for Disabilities

Students that need accommodations because of a disability, have emergency medical information to share, or need special arrangements in case the building must be evacuated should inform the instructor immediately, privately after class or in her or his office. Students must present a current accommodation plan from a staff member in Disability Services (DS) in order to receive accommodations in this course. Disability Services (http://www.pstcc.edu/sswd/) may be contacted via Disability Services email or by visiting Alexander 130.