

SOUTHEAST COMMUNITY COLLEGE
CONSTRUCTION, MANUFACTURING AND TECHNOLOGY DIVISION
Energy Generation Operations Technology Program
Revision Date: August 24, 2020

I. CATALOG DESCRIPTION

Course Number: ENER2130
Course Title: Green Energy Technologies
Prerequisite(s): None
Catalog Description: This course is an introduction to various green energy technologies including wind, solar, hydro and other types of renewable energy. Topics covered include physics, fluid dynamics, aerodynamics and various solar generation principles. A basic description of wind turbine systems and current and future solar generating systems is included as well as a description of hydroelectric facilities.
Credit Hours: 2.0
Class Hours: 30
Lab Hours: 0
Total Contact Hours: 30

II. COURSE OBJECTIVES: *Course will:*

- A. Introduce students to various renewable “green” technologies in the energy generation industries.
- B. Provide descriptions of current wind, solar, hydro and other renewable systems.
- C. Introduce students to new, emerging technologies with respect to energy generation.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES:

- A. Student Learning Outcomes: *Student will be able to:*
 - 1. Describe the current technologies used in alternative and green technologies.
 - 2. Discuss biofuels and biomass energy systems and describe their advantages and limitations.
 - 3. Understand nuclear power as an alternative energy source and its contribution to climate change prevention.
 - 4. Describe solar electric generating systems, including PV, CSP, and solar thermal systems.
 - 5. Describe wind turbine technology and its capabilities and limitations as an alternative energy system.
 - 6. Describe hydroelectric and geothermal energy systems.
 - 7. Discuss emerging energy technologies.
- B. General Education Learning Outcomes (GELOs)
 - 1. GELO #3: Critical Thinking & Problem Solving
 - Outcome 4: Evaluate the validity of arguments, alternatives, data, outcomes, and/or impacts of actions.

IV. CONTENT/TOPICAL OUTLINE

- A. Introduction to alternative and renewable energy
 - 1. Importance of renewable energy
 - 2. Energy efficiency
 - 3. Alternative energy sources
 - 4. Environmental considerations

- B.** Biomass and biofuels
 - 1. Biomass sources and uses
 - 2. Biomass energy production
 - 3. Advantages and disadvantages
 - 4. Trends in biomass and biofuels
- C.** Nuclear power
 - 1. Nuclear power and its sources
 - 2. Development and generation
 - 3. Advantages and disadvantages
 - 4. Trends in nuclear power
- D.** Solar Power
 - 1. Solar thermal applications
 - 2. Solar photovoltaic (PV) applications
 - 3. PV system components
 - 4. Emerging solar technologies
- E.** Wind Power
 - 1. Trends in wind power
 - 2. Wind energy
 - 3. Wind turbines
- F.** Hydroelectric systems and geothermal systems
 - 1. The development of the hydropower industry
 - 2. Power station types
 - 3. Geothermal power
- G.** Energy storage techniques
 - 1. Batteries
 - a. Lead-Acid batteries
 - b. Lithium-Ion batteries
 - c. Other batteries in development
 - 2. Mechanical storage systems
 - 3. Hydrogen fuel
 - 4. Thermal storage
- H.** Emerging energy technologies
 - 1. Smart Grid technologies and controls
 - 2. Next generation nuclear power
 - 3. International Thermonuclear Experimental Reactor (ITER)
 - 4. Converting waste heat to electricity
 - 5. Microbes in biofuel production
 - 6. Solid oxide fuel cells
 - 7. Alternative wind farms
 - 8. Alternative hydropower systems

V. INSTRUCTIONAL MATERIALS

- A.** Required Text(s): NCCER Alternative Energy, Trainee Guide, Pearson Education
- B.** Other Resources: Internet
- C.** Outside Reading/Research required: Internet Research assignments
- D.** Supplies: 3 ring binder with blank paper for notes and USB Flash Drive

VI. METHODS OF PRESENTATION/INSTRUCTION

- A.** Methods of presentation typically include a combination of the following:
 - 1. Hybrid class

VII. METHODS OF EVALUATION

- A.** Methods of evaluation, although determined by the individual instructor, traditionally includes a combination of the following:
 - 1.** Class participation
 - 2.** Regular assignments
 - 3.** Written exams and/or quizzes
 - 4.** Performance and observational assessments

VIII. SPECIFIC COURSE REQUIREMENTS

- A.** A minimum grade of “C” or a minimum of 70% is required to receive credit for this course.
- B.** Cheating within the Manufacturing Division: Any violation of academic integrity on assignments, quizzes, or tests will result in a grade of 0 on that assignment, quiz, or test. A second violation in any course after the initial infraction will result in a grade of F for that course. Any additional violations while in the program will result in a suspension from the program. For additional information, refer to the Academic Integrity pamphlet available from Student Services.
- C.** Credit by Examination: Credit for the course CANNOT be earned through Credit by Examination.