Course Number and Title: NRG 154 Alternative Energy Technologies

Campus Location:
Georgetown, Dover, Stanton

Effective Date:
2020-51

Prerequisite:
NRG 101, OAT 152 or DAT 101, MAT 020, SSC 100 or concurrent

Co-Requisites:
none

Course Credits and Hours:
3.00 credits
2.00 lecture hours/week
2.00 lab hours/week

Course Description:
This course includes a survey of energy sources such as geothermal, wind, low head hydro, solar, and biomass. Environmental, social, and economic advantages of each source are assessed.

Required Text(s):
Obtain current textbook information by viewing the campus bookstore - https://www.dtcc.edu/bookstores online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:
To be selected by each campus

Schedule Type:
Classroom Course
Hybrid Course
Online Course

Disclaimer:
None

Core Course Performance Objectives (CCPOs):

1. Engage in professional behavior. (CCC 1, 3, 4, 5)
2. Explain the fundamental concepts of energy production from a variety of alternative sources. (CCC 1, 2, 6; PGC SOL 5, 6, 7; NRG 7)
3. Compare and contrast energy production from different sources, both renewable and non-renewable. (CCC 1, 2, 5; PGC SOL 5, 6; NRG 7)
4. Compare the advantages and disadvantages of various types of energy production based upon economic, environmental, and social considerations. (CCC 2, 5, 6; PGC SOL 4, 5, 6, NRG 6, 7)
5. Discuss the major site issues in determining the feasibility of energy sources such as solar, wind, hydro, and geothermal. (CCC 2, 5, 6; PGC SOL 4, 5, 6; NRG 6, 7)
6. Estimate energy production from major renewable energy sources with a focus on technology that may be found in the Delaware region. (CCC 1, 2, 4, 5, 6; PGC SOL 5, 6; NRG 7)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):
Upon completion of this course, the student will:

1. Engage in professional behavior.
    1. Demonstrate punctuality when attending class, participating in off-site projects, and submitting assignments.
    2. Communicate using industry-appropriate language in presentations, reports, and homework.
    3. Demonstrate appropriate professional behavior when working with others.
2. Explain the fundamental concepts of energy production from a variety of alternative sources.
    1. Identify the historical applications of alternative energy sources.
    2. Discuss current issues in alternative energy development.
3. Compare and contrast energy production from different sources, both renewable and non-renewable.
    1. Compare the major features of renewable and non-renewable energy production.
    2. Identify energy sources that use a turbine and generator to produce electricity, and contrast the different means of turning the turbine.
4. Compare the advantages and disadvantages of various types of energy production based upon economic, environmental, and social considerations.
    1. Discuss the major factors and inhibitors for growth of a variety of alternative energy sources.
    2. Identify political factors that increase or decrease alternative energy production.
    3. Identify economic factors that affect alternative energy production.
    4. Debate the benefits and detriments of alternative energy production, including offshore wind, solar farms, residential wind, biofuels, fuel cells, and/or other technologies.
    5. Examine the effects of alternative energy production on animals, humans, and the landscape.
5. Discuss the major site issues in determining the feasibility of energy sources such as solar, wind, hydro, and geothermal.
    1. Identify locations that are suitable for alternative energy technologies.
    2. Discuss the effect of elevation on the feasibility of alternative energy sources.
    3. Evaluate the influence of shading on the feasibility of alternative energy technologies.
6. Estimate energy production from major renewable energy sources with a focus on technology that may be found in the Delaware region.
    1. Perform back-of-the-envelope calculations for number of kW installed needed, based upon yearly electric consumption for commonly used residential energy sources, including solar, wind, and geothermal.
    2. Define basic solar energy terminology, including *solar radiation, solar constant, air mass, solar irradiance, solar irradiation, peak sun, peak sun hours,* and *insolation.*
    3. Evaluate sun hours, and calculate the effect on total energy output.
    4. Calculate the wind speed effect on total energy output of a wind turbine.

Evaluation Criteria/Policies:
Students must demonstrate proficiency on all CCPOs at a minimal 75 percent level to successfully complete the course. The grade will be determined using the Delaware Tech grading system:

92	–	100	=	A
83	–	91	=	B
75	–	82	=	C
0	–	74	=	F

Students should refer to the Student Handbook - https://www.dtcc.edu/handbook for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):
Energy Management

1. Utilize building system and energy technology hardware and software to gather data on building lighting systems operation and energy consumption.
2. Utilize building system and energy technology hardware and software to gather data on heating, ventilation, and air conditioning (HVAC) systems operation and energy consumption.
3. Calculate, analyze, and verify the energy use of buildings based upon the interaction of energy consuming building systems.
4. Evaluate residential buildings and make recommendations for optimized building performance and occupant comfort.
5. Evaluate commercial buildings and make recommendations for optimized building performance and occupant comfort.
6. Prepare and present technical reports.
7. Analyze the economic, environmental, and business implications of potential energy measures.

Renewable Energy Solar

1. Utilize building system and energy technology hardware and software to gather data on building lighting systems operation and energy consumption.
2. Calculate, analyze, and verify the energy use of buildings based upon the interaction of energy consuming building systems.
3. Evaluate residential buildings and make recommendations for optimized building performance and occupant comfort.
4. Prepare and present technical reports.
5. Analyze the economic, environmental, and business implications of potential energy measures.
6. Perform preliminary and in depth site and customer suitability evaluation of potential applications for solar use.
7. Design and calculate the output of an optimal site-specific array by deriving panel configuration and specifying components.

Disabilities Support Statement:
The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the disabilities services - https://www.dtcc.edu/disabilitysupport web page or visit the campus Advising Center.