Course Number and Title: NRG 250 Energy Accounting and Investment Analysis

Campus Location:
Georgetown, Dover, Stanton

Effective Date:
2022-51

Prerequisite:
NRG 111, (OAT 152 or DAT 101), ENG 101

Co-Requisites:
none

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

Course Description:
This course covers the basics of energy accounting and energy investment analysis. Students perform a full utility bill analysis and life cycle cost analysis, and quantify environmental benefits for an energy conservation measure.

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:
None

Schedule Type:
Classroom Course
Video Conferencing

Disclaimer:
None

Core Course Performance Objectives (CCPOs):

1. Engage in professional behavior. (CCC 1, 3, 4, 5)
2. Analyze and evaluate relevant information from utility bills and online databases, and input into a software program. (CCC 2, 5, 6; PGC NRG 3; SOL 2)
3. Calculate and evaluate a building's energy performance through various energy accounting techniques. (CCC 2, 5, 6; PGC NRG 3; SOL 2)
4. Calculate energy costs and savings for buildings using several utility rate structures. (CCC 2, 5, 6; PGC NRG 3,7; SOL 2, 5)
5. Construct a building or campus energy use database using appropriate software. (CCC 2, 5, 6; PGC NRG 3; SOL 2)
6. Calculate life cycle cost and defend the benefit of using life cycle cost analysis over simple payback methods. (CCC 1, 2, 6; PGC NRG 7; SOL 5)
7. Construct supplementary measures and a sensitivity analysis for a cost-benefit analysis. (CCC 2, 6 ; PGC NRG 7; SOL 5)
8. Evaluate how financing and tax benefits/credits can affect a life cycle analysis. (CCC 1, 2, 6 ; PGC NRG 7; SOL 5)
9. Prepare a report, and present information describing a cost-benefit analysis. (CCC 1, 4, 5; PGC NRG 6, 7; SOL 4, 5)

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. Analyze and evaluate relevant information from utility bills and online databases, and input into a software program.
    1. Select pertinent use and cost data from utility bills, and analyze it using the appropriate software.
    2. Identify and explain both distribution and supply charges on electricity bills.
    3. Construct monthly and yearly trends from the gathered data.
    4. Plot and evaluate hourly and/or sub-hourly energy use data trends.
    5. Given hourly or sub-hourly energy use and the utility rate structure, calculate the charges.
3. Calculate and evaluate a building's energy performance through various energy accounting techniques.
    1. Calculate the energy utilization index (EUI) and the energy cost index (ECI) using appropriate data.
    2. Compare buildings' energy use to similar buildings using the EUI, the ECI, and the commercial building energy consumption survey.
    3. Compute an adjusted baseline with weather normalization by using heating and cooling degree days.
    4. Evaluate potential energy use and demand savings by performing a load factor analysis.
    5. Determine the impact of demand response and demand limiting initiatives on operations.
    6. Discuss and evaluate the impact that changes in the building (e.g., new equipment or renovations) can have on utility bills.
    7. Calculate the greenhouse gas emissions based on the building's energy usage.
4. Calculate energy costs and savings for buildings using several utility rate structures.
    1. Compare and contrast utility rate structures.
    2. Locate local third-party suppliers of electricity.
    3. Calculate the cost difference of changing a building's utility rate structure or changing suppliers.
    4. Analyze how annual energy savings, peak demand savings, and power factor charges can differ among several energy conservation measures.
5. Construct a building or campus energy use database using appropriate software.
    1. Select pertinent cost and energy use data from utility bills, and input into Environmental Protection Agency's (EPA's) portfolio manager or other benchmarking software.
    2. Compare buildings using the benchmarking software rating feature.
6. Calculate life cycle cost and defend the benefit of using life cycle cost analysis over simple payback methods.
    1. Compare and contrast interest rate and discount rate.
    2. Construct a cash flow chart using relevant lifecycle cost factors.
    3. Evaluate the effect that discount rate has on cash flow.
    4. Analyze how inflation and current dollar analysis are related.
    5. Compose and compare current dollar and constant dollar analyses.
    6. Explain when an analyst would use constant dollar analysis instead of current dollar analysis and vice versa.
    7. Integrate escalating costs (e.g., for energy, labor, and so on) into a cost benefit analysis.
    8. Evaluate energy conservation measures by using simple payback and life cycle cost analysis and compare the results.
7. Construct supplementary measures and a sensitivity analysis for a cost-benefit analysis.
    1. Calculate and judge the value of the following supplemental measures: net savings, savings to investment ratio, adjusted internal rate of return, and simple payback.
    2. Perform a sensitivity analysis and evaluate the results.
8. Evaluate how financing and tax benefits/credits can affect a life cycle analysis.
    1. Investigate local, state, and/or federal tax incentives for energy efficiency and alternative energy.
    2. Construct a life cycle cost analysis with and without tax incentives, and discuss the results.
    3. Construct a life cycle cost analysis with and without financing options, and discuss the results.
    4. Construct a life cycle cost analysis using an after-tax cash flow with both straight-line and accelerated depreciation schedules.
9. Prepare a report and present information describing a cost-benefit analysis.
    1. Design a cost-benefit analysis for an energy conservation measure that includes supplementary measures, sensitivity analysis, tax incentives, environmental benefits, and utility rates.
    2. Describe the methodology of the cost-benefit analysis and any assumptions made.
    3. Taking into account the life cycle cost analysis, make and report recommendations on a given alternative, and defend the choice of the alternative suggested.

Evaluation Criteria/Policies:
The grade will be determined using the Delaware Tech grading system:

90	–	100	=	A
80	–	89	=	B
70	–	79	=	C
0	–	69	=	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.

Final Course Grade:
Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Summative: Mid-Term	15%
Summative: Final	15%
Summative: Final Presentation/Paper	10%
Summative: Tasks (equally weighted)	30%
Formative (quizzes, homework)	30%
TOTAL	100%

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.