AC R050L: ENERGY AUDITING LAB

Originator
aainsworth

College
Oxnard College

Discipline (CB01A)
AC - AirConditioning&Refrigeration

Course Number (CB01B)
R050L

Course Title (CB02)
Energy Auditing Lab

Banner/Short Title
Energy Auditing Lab

Credit Type
Credit

Start Term
Fall 2021

Formerly
ENVT R050L

Catalog Course Description
Energy auditing is part of the growing industry of green and sustainable technologies; an energy auditor helps to optimize the energy efficiency of a home or building while reducing the client's energy costs. An energy audit can also have a positive impact on the environment by reducing unnecessary energy consumption. This lab course accompanies the energy auditing lecture course and provides hands-on instruction on the proper safety practices and energy auditing tools necessary to perform an energy audit. Students will also learn how to use energy auditing software to gather and analyze energy auditing data. Many of the procedures and tests that are performed in an energy audit revolve around the heating and cooling systems, and therefore a student interested in taking this course should have foundation level HVAC/R knowledge.

Taxonomy of Programs (TOP) Code (CB03)
0945.00 - *Industrial Systems Technology and Maintenance

Course Credit Status (CB04)
D (Credit - Degree Applicable)

Course Transfer Status (CB05) (select one only)
C (Not transferable)

Course Basic Skills Status (CB08)
N - The Course is Not a Basic Skills Course

SAM Priority Code (CB09)
C - Clearly Occupational

Course Cooperative Work Experience Education Status (CB10)
N - Is Not Part of a Cooperative Work Experience Education Program

Course Classification Status (CB11)
Y - Credit Course

Educational Assistance Class Instruction (Approved Special Class) (CB13)
N - The Course is Not an Approved Special Class

Course Prior to Transfer Level (CB21)
Y - Not Applicable

Course Noncredit Category (CB22)
Y - Credit Course

Funding Agency Category (CB23)
Y - Not Applicable (Funding Not Used)

Course Program Status (CB24)
1 - Program Applicable

General Education Status (CB25)
Y - Not Applicable

Support Course Status (CB26)
N - Course is not a support course

Field trips
May be required

Grading method
Letter Graded

Does this course require an instructional materials fee?
No

Repeatable for Credit
No

Is this course part of a family?
No

Units and Hours

Carnegie Unit Override
No

In-Class

Lecture
Minimum Contact/In-Class Lecture Hours
17.5
Maximum Contact/In-Class Lecture Hours
17.5

Activity

Laboratory
Minimum Contact/In-Class Laboratory Hours
52.5
Maximum Contact/In-Class Laboratory Hours
52.5

Total in-Class

Total in-Class
Total Minimum Contact/In-Class Hours
70
Total Maximum Contact/In-Class Hours
70

Outside-of-Class

Internship/Cooperative Work Experience

Paid

Unpaid

Total Outside-of-Class

Total Outside-of-Class
Minimum Outside-of-Class Hours
35
Maximum Outside-of-Class Hours
35

Total Student Learning

Total Student Learning
Total Minimum Student Learning Hours
105
Total Maximum Student Learning Hours
105

Minimum Units (CB07)
2
Maximum Units (CB06)
2

Student Learning Outcomes (CSLOs)

	Upon satisfactory completion of the course, students will be able to:
1	Demonstrate the proper handling and use of the diagnostic equipment that is used by an energy auditor
2	Perform a blower door and duct test
3	Utilize infrared imaging to determine/identify energy waste
4	Record and interpret data using energy auditing software

Course Objectives

	Upon satisfactory completion of the course, students will be able to:
1	Explain different types of audits that an energy auditor performs.
2	Demonstrate the proper handling and use of the diagnostic equipment that is used by an energy auditor. e.g. Infrared imagers, manometers, blower doors and duct blasters.
3	Demonstrate safe practices that are necessary for an energy auditor to complete an energy audit.
4	Record and interpret data using energy auditing software. e.g. EnergyPro
5	Perform a blower door and duct integrity test.
6	Perform a domestic water audit.
7	Utilize infrared imaging to identify energy waste.

Course Content

Lecture/Course Content

1. Energy Audit Types: Students will learn to assess the various components associated with building energy performance and how to design/ build this assessment.
   a. Structural systems
   b. Mechanical/electrical systems
   c. Residential audits
   d. Designing a building audit/ assessment using EnergyPro audit software
2. Safety: will include but not be limited to:
   a. Introduction to OSHA standards
   b. Personal Protective Equipment
   c. Basic Hand and Power Tool Safety
   d. Ladder Safety
   e. Electrical/Ground-fault Protection Safety
3. Diagnostic Equipment: students will learn the proper usage and care of various instruments used to assess building performance including but not limited to:
   a. Thermal Imagers
   b. Door blower
   c. Duct blaster
   d. Power analyzer
   e. Monitoring modules for HVAC/R systems
   f. Flow hood
   g. Lighting/occupancy monitoring systems
   h. Combustion/ CO2 monitors/ analyzers
   i. Bore scope

Laboratory or Activity Content

The 50L lab class affords the students an opportunity to get "hands on" experience/ training in the following.

Energy Audits: In these lab exercises, students will perform both 'desk top' audits and actual audits for the various building components listed below. This includes establishing baseline energy assessments and making recommendations to improve the building's energy efficiency including calculating a return on investment (ROI).

1. Structural systems: Assessing the building envelope to determine its ability to maintain optimal interior conditions using heat transfer principles, energy monitors and thermal imaging.
2. Mechanical systems: Assessing the performance of mechanical systems including the use of power analyzers and monitoring equipment.
3. Electrical systems: Assessing the performance of the primary electrical systems including the use of power analyzers and monitoring equipment.
4. Lighting systems: Assessing the performance of the lighting system including the use of power analyzers and monitoring equipment.
5. Water systems: Assessing the usage of water systems including the use of monitoring systems.
6. Residential audits: Assessing the energy efficiency of residential occupancies using techniques and tools learned in the aforementioned sessions.
7. Building audits: designing and planning audits including building teams and establishing check lists to aid in planning energy audits. Using software to collect and analyze data from an audit.

Safety: Prior to each lab exercise, a safety talk is given that relates to the activities required to perform the lab. This includes but is not limited to:

1. Personal Protective Equipment
2. Basic Hand and Power Tool Safety
3. Ladder Safety
4. Electrical/Ground-fault Protection Safety

Diagnostic Equipment: Students will learn the safe and proper care/ usage of various instruments necessary to perform energy audits. This includes, but is not limited to, the following.

1. Thermal Imagers to test for heat loss/gains.
2. Door blower used to test structures for air leaks.
3. Duct blaster to test the duct integrity.
4. Power analyzer to assess electrical systems.
5. Monitoring modules for HVAC/R systems
6. Flow hood to test for proper air flow.

7. Lighting/occupancy monitors used to assess building usage and lighting schedules.
8. Instruments to measure CO2 levels and perform combustion analysis for gas fueled heating systems.
9. Bore scopes to check furnace heat exchanger integrity and inspect various building systems.

Methods of Evaluation

Which of these methods will students use to demonstrate proficiency in the subject matter of this course? (Check all that apply):

Problem solving exercises
Skills demonstrations

Methods of Evaluation may include, but are not limited to, the following typical classroom assessment techniques/required assignments (check as many as are deemed appropriate):

Laboratory activities
Objective exams
Other (specify)
Projects
Problem-Solving Assignments
Skills demonstrations

Other

Discussion Participation

Instructional Methodology

Specify the methods of instruction that may be employed in this course

Audio-visual presentations
Class discussions
Demonstrations
Lecture

Describe specific examples of the methods the instructor will use:

- Instruction includes classroom lecture, with equipment demonstrations, followed by the student actually performing hands-on lab activities.
- Frequent quizzes and practice problems may be utilized to assess student comprehension of course content which will also stimulate student/instructor discussion.
- Class discussion related to various types of residential and building energy audits, the instructor will provide real-world examples of energy audits and engage students in a dialogue

Representative Course Assignments

Writing Assignments

Students may be required to complete written homework assignments that consist of end-of-chapter questions relating to various aspects of the energy auditing process.

Students may be given energy auditing scenarios and may be asked to complete a written summary of recommendations to make the home or building energy efficient.

Critical Thinking Assignments

Students will be assigned problems describing specific building designs/ conditions with the expectation of using logic and reasoning to build an energy audit plan that, if implemented, would identify ways to improve the buildings energy efficiency. This would include identifying resources needed to both perform the audit and make modifications to the structure and/ or occupants practices.

Reading Assignments

Students are asked to read the assigned curriculum prior to each class in order to be prepared for the energy auditing course topic and lab activity that the instructor will cover for a particular class.

Students will be asked to visit websites that host information on energy efficiency and read specific energy auditing information, examples of sites are www.escoinst.com (http://www.escoinst.com), www.everblue.edu/RESNET (http://www.everblue.edu/RESNET), and www.bpi.org (http://www.bpi.org).

Skills Demonstrations

Demonstrate the proper handling and use of the diagnostic equipment that is used by an energy auditor.

Perform a blower door and duct test.

Utilize infrared imaging to determine/identify energy waste.

Record and interpret data using energy auditing software.

Other assignments (if applicable)

Students may be asked to research energy auditing equipment and perform comparative pricing online to familiarize themselves with equipment that may be necessary for an energy auditor but is not currently available in the program.

Outside Assignments

Representative Outside Assignments

Reading: Students are asked to read the assigned curriculum prior to each class in order to be prepared for the energy auditing course topic and lab activity that the instructor will cover for a particular class.

Students will be asked to visit websites that host information on energy efficiency and read specific energy auditing information; examples of sites are www.escoinst.com, www.everblue.edu/RESNET, and www.bpi.org.

Writing: Students may be required to complete written homework assignments that consist of end-of-chapter questions relating to various aspects of the energy auditing process.

Students may be given energy auditing scenarios and may be asked to complete a written summary of recommendations to make the home or building energy efficient.

Other: Students may be asked to research energy auditing equipment and perform comparative pricing online to familiarize themselves with equipment that may be necessary for an energy auditor but is not currently available in the program.

District General Education

A. Natural Sciences

B. Social and Behavioral Sciences

C. Humanities

D. Language and Rationality

E. Health and Physical Education/Kinesiology

F. Ethnic Studies/Gender Studies

CSU GE-Breadth

Area A: English Language Communication and Critical Thinking

Area B: Scientific Inquiry and Quantitative Reasoning

Area C: Arts and Humanities

Area D: Social Sciences

Area E: Lifelong Learning and Self-Development

CSU Graduation Requirement in U.S. History, Constitution and American Ideals:

IGETC

Area 1: English Communication

Area 2A: Mathematical Concepts & Quantitative Reasoning

Area 3: Arts and Humanities

Area 4: Social and Behavioral Sciences

Area 5: Physical and Biological Sciences

Area 6: Languages Other than English (LOTE)

Textbooks and Lab Manuals

Resource Type
Textbook

Classic Textbook
Yes

Description
Petit, R.F., Collins, T.L., Delatte, E., & Rasmussen, E. (2014). *System Performance: Maximizing Energy Efficiency* (1st). Mount Prospect ESCO Press. 1930044313

Resource Type
Textbook

Classic Textbook
Yes

Description
Fluke Corporation (2011). *Energy Auditing for Industrial Facilities*. American Technical Publishers.

Resource Type
Other Resource Type

Description
Energy auditing related websites such as www.escoinst.com, www.everblue.edu/RESNET, and www.bpi.org..

Resource Type
Other Resource Type

Description
Energy auditing equipment manuals .

Primary Minimum Qualification
AIR COND/REFRIG/HEATING

Review and Approval Dates

Department Chair
09/16/2020

Dean
09/17/2020

Technical Review
10/14/2020

Curriculum Committee
10/14/2020

Curriculum Committee
12/09/2020

CCCCO
MM/DD/YYYY

Control Number
CCC000533868

DOE/accreditation approval date
MM/DD/YYYY