

ENRG 50 - Introduction to Commercial Building Audits

COURSE DESCRIPTION: Overview of the energy auditing process for commercial buildings. Topics include various levels of audits, defining scope of work, preliminary assessment of building performance data, collection and assessment of building system operations, analysis of data, developing recommendations, report preparation and presentation.

36 Hours (27 lecture, 9 lab)

LEARNING OUTCOMES:

- Describe the various levels and phases of work for commercial building audits
- Describe and classify the types of data collected for use in a commercial building audit
- Describe field safety considerations and techniques necessary for on-site building assessments
- Analyze data in order to identify opportunities to reduce energy consumption and improve building operational efficiency, and formulate action recommendations
- Estimate financial implications of recommended upgrades
- Integrate findings and recommendations into a written report

COURSE TOPICS:

- I. Introduction to concepts of commercial building energy auditing
 - A. Energy use and waste in commercial building operations
 - B. Prioritizing energy efficiency over renewable energy generation
- II. Ordinances, policies and standards governing commercial building audits
 - A. San Francisco Existing Commercial Buildings Performance Ordinance
 - B. State of California energy goals
 - C. ASHRAE standards, including Building Energy Assessment Professional (BEAP)
- III. Three ASHRAE audit levels
 - A. Level 1, Basic energy analysis
 - B. Level 2, Intermediate, walk through and energy analysis
 - C. Level 3, Detailed analysis of capital-intensive modifications
- IV. Scope of work in a commercial building audit
 - A. Objectives of the audit, including needed data and resources
 1. Client goals
 2. Data needed
 3. Data resources
 - B. Assessment management
 1. Project scope
 2. Project schedule
 3. Responsibilities of audit team members
 - C. Requirements for data acquisition
 1. Baseline information requirements
 2. Analysis tools
- V. Elements in preliminary analysis of building performance data
 - A. Engineering and architectural document review
 - B. Geographical and climatic review
 - C. Review and analysis of current energy use and costs
 - D. Benchmarking procedures
- VI. Factors in on-site building assessment
 - A. Common safety hazards and field safety techniques
 - B. Occupant interviews and assessment of building operations
 - C. Building envelope
 - D. Electrical systems

- E. HVAC&R systems
- F. Lighting systems and use
- G. Miscellaneous other energy use systems
 - 1. Process equipment
 - 2. Tenant equipment and plug-load
 - 3. Conveyance systems such as elevators and escalators
- H. Domestic water systems and use
 - I. Indoor environmental quality
- VII. Analysis of data collected
 - A. Identify opportunities for efficiency improvements
 - B. Calculate value of efficiency improvements and return on investment
 - C. Prioritize options based on client criteria
- VIII. Audit completion activities
 - A. Prepare and present written report
 - B. Assist with development of implementation plan

TYPES OF ASSIGNMENTS:

- I. In-class
 - A. Participation in class discussions
 - B. Problem sets on lecture topics
 - C. Problem sets and calculations on sample data, such as energy benchmark data
 - D. Small group assignments, such as mock client interviews or presentations of findings
 - E. Possible field trips such as the Pacific Energy Center, or walk through commercial buildings for on-site data collection
- II. Out-of-class
 - A. Reading assignments from texts, websites or instructor handouts
 - B. Applied energy calculations, engineering analysis, and experimental verifications
 - C. Sample written communications with "clients", such as emails or memos requesting information or scheduling site visits
 - D. Applied calculations of financial impacts of energy efficiency improvements
 - E. Written report demonstrating knowledge of audit procedures

TEXTBOOKS & RESOURCES:

- Websites of regulatory agencies, professional organizations and engineering firms such as ASHRAE, AAEE, NREL, CEC, SFEnvironment, etc.
- Free classes and materials from the Pacific Energy Center
- Instructor prepared handouts on topics such as safety considerations, Title 24, energy consumption variables