



SYLLABUS

BENCHMARKING AND ASSESSMENT OF BUILDING ENERGY PERFORMANCE

Instructor: To Be Determined

Office: To Be Determined

Contact Info: To Be Determined

Credit: 3 Hours

Course Description: An introduction and study of building energy assessment principles and protocols for existing commercial buildings. Course topics include hands-on techniques of energy measurement and verification, IEQ parameter identification and measurement, energy metric comparison and analysis, and energy auditing, applied in the context of a building disclosure, rating, and labeling program.

Course Objectives: Upon completion of the course, students will have the ability to assess the energy performance of an existing building, using industry-standard methods, by applying their knowledge of thermal sciences and building mechanical/electrical systems. The course will build a foundation of knowledge regarding building energy assessment and the application of building disclosure and rating programs through hands-on exploration in real buildings under the guidance of practicing professionals. Outcomes of the course include:

- Conduct an ASHRAE Level 1 energy audit for the building provided in the class
- Produce an ASHRAE Building EQ In Operation rating for the buildings provided in the class
- Produce a listing of potential Energy Efficiency Measures (EEM) including economic feasibility analysis
- Perform measurements of indoor environmental quality and HVAC system performance
- Identify different building types and determine the impact of climate on energy use.
- Analyze raw energy consumption data from measured-meter readings
- Understand energy metrics and how they are developed and applied
- Understand the process of certifying professionals in energy assessment

Prerequisites: Senior standing and permission, or Graduate standing. Students are expected to have previous coursework on building thermal sciences (e.g., thermodynamics, heat transfer, building physics) and knowledge of building mechanical and electrical systems.

Texts: ASHRAE Procedures for Commercial Building Energy Audits, 2nd edition

- References:
- ASHRAE Standard 100-2015 Energy Efficiency in Existing Buildings
 - ASHRAE Standard 90.1-2016 Energy Standard for Buildings Except Low-Rise Residential Buildings
 - ASHRAE Standard 62.1-2016 Ventilation for Acceptable Indoor Air Quality
 - ASHRAE Standard 55-2013 Thermal Environmental Conditions for Human Occupancy
 - ASHRAE Standard 105-2014 Standard Methods of Determining, Expressing, and Comparing Building Energy Performance and Greenhouse Gas Emission
 - ASHRAE Performance Measurement Protocols for Commercial Buildings: Best Practices Guide
 - Sample forms and templates for energy audits.
<http://www.ashrae.org/pcbea>.
 - ASHRAE Building EQ Program Website <http://www.ashrae.org/buildingeq>.
 - ASHRAE Building Energy Assessment Professional (BEAP) Candidate Guidebook, <http://www.ashrae.org/beap>.
 - ENERGY STAR® for Buildings website, <http://www.energystar.gov/buildings>.
 - DOE Advanced Energy Retrofit Guides,
<https://energy.gov/eere/buildings/advanced-energy-retrofit-guides>
- Evaluation: Final project will include an ASHRAE energy audit along with an ASHRAE Building EQ rating submission for a building provided in the course. Graduate students will be further required to produce a technical paper (with the title, purpose, and scope to be determined at a later date). Costs paid to ASHRAE for a Building EQ submission are not the responsibility of the student.
- Grading: To Be Determined
- Homework: All quizzes and homework assignments are due at the time and date listed for the assignment. Any assignment turned in after the due date and time will be considered late. Late assignment will be accepted up to 24 hours after its due date with a 50% reduction in grade. No assignment will be accepted after that time.
- Participation: Punctuality, class attendance and participation are reflections of your professionalism. Unavoidable absences must be reported to the instructor or the department office prior to the absence.
- Course Web Site: A course web site will be constructed for this course. The course web site will be used extensively to distribute information and to provide access to course materials and resources. Accordingly, it is the student's responsibility

to regularly review the course web site and to ensure that the student's contact information is accurate and up to date.

Code of Conduct: All students are expected to comply with University's Code of Conduct. Any student found guilty of academic dishonesty shall be subject to both academic and disciplinary sanctions, as outlined in the 'Student Rights and Responsibilities' section of the undergraduate bulletin. Students shall comply with ASHRAE copyright and privacy policies.