

**MECHANICAL ENGINEERING PROGRAM**  
**ABET COURSE SYLLABUS**

**ME 454. Benchmarking and Assessment of Building Energy Performance. (4) Elective**

<b>Course Description:</b> (2019-20 Catalog)	An introduction and study of building energy assessment principles and protocols for existing commercial buildings. Course topics include techniques of energy measurement and verification, energy metric comparison and analysis, and energy auditing. Field trip required. 3 lectures, 1 laboratory.
<b>Prerequisite Courses:</b>	ME 350, Recommended: ME 359.
<b>Prerequisites by Topic:</b>	Coverage of all topics presumes completion of basic engineering science courses in thermodynamics and fluid mechanics and heat transfer.
<b>Textbook:</b> (and/or other required material)	<u>ASHRAE Procedures for Commercial Building Energy Audits</u> , 2nd edition <u>ASHRAE Standard 100-2015 Energy Efficiency in Existing Buildings</u>
<b>References:</b>	<u>ASHRAE Standard 55-2013 Thermal Comfort</u> <u>ASHRAE Standard 62.1-2016 Ventilation for Acceptable Indoor Air Quality</u> <u>ASHRAE Standard 90.1-2016 Energy Standard for Buildings Performance Measurement Protocols for Commercial Buildings: Best Practices Guide, ASHRAE 2012</u>
<b>Course Coordinator/Instructor:</b>	Jennifer Mott Peuker, Assistant Professor of ME
<b>Course Learning Outcomes:</b>	The students will be able to: <ol style="list-style-type: none"><li>1. Discuss the global energy consumption characteristics and the role of commercial and residential buildings.</li><li>2. Explain the building energy end use consumption characteristics and the impact of time variations in building energy consumption.</li><li>3. Describe the typical primary and secondary HVAC equipment and their role in meeting system requirements in commercial buildings, and the basics of lighting system in buildings, energy performance, and the role of daylighting.</li><li>4. Compare and contrast the differences between benchmarking, labeling programs, and energy and environmental auditing.</li><li>5. Conduct a space function analysis: including analyze utility rate schedules and energy billing data, compare energy performance to similar buildings, develop appropriate energy target</li></ol>

requirements and compare alternative energy targets for similar buildings.

6. Perform measurements of indoor environmental quality and building energy flows, and evaluate the accuracy of building measurements.
7. Evaluate the thermal comfort, indoor air quality, and indoor environmental quality by applying the ASHRAE standards in a commercial building.
8. Identify common energy efficiency measures for HVAC and lighting systems and explain their impacts on the building energy usage, economics and environment.

**Relationship of Course to Mechanical Engineering Student Outcomes:**

SO 1: Mastered (M)  
SO 2:  
SO 3: Mastered (M)  
SO 4: Mastered (M)  
SO 5:  
SO 6: Mastered (M)  
SO 7:

**Topics Covered:**

1. Building energy usage and energy benchmarking
2. Review building mechanical, electrical, and lighting systems
3. Building energy benching marking and assessment
4. Preliminary Energy Use Analysis
5. Measuring and monitoring building performance
6. Indoor Environment Quality
7. Energy Efficiency Measures
8. Energy audit report preparation

**Class/Lab Schedule:**

Three 50-minute lectures per week. One 170-minute lab per week.

**Contribution of Course to Meeting the Professional Component:**

(a) College-level mathematics and basic sciences:	0 credits
(b) Engineering Topics:	4 credits
Design:	0 credit
(c) General Education:	0 credits
(d) Other:	0 credits

**Prepared by:**  
Jennifer Mott Peuker

**Date:**  
9/16/19

---