كلية الهندسة

**ME221 Thermodynamics-I (Required Course)**

**Code and Name:** ME221 Thermodynamics-I
**Credit Hours:** 3 (Lecture: 3, Tutorial: 1)

**Textbook:**
- Thermodynamics – An Engineering Approach, Yunus A. Cengel, and Michael A. Boles, 7th Edition, McGraw Hill Higher Education, 2011.

**Other References:**
- Understanding Thermodynamics, H.C. Van Ness, Dover Education Edition, Dover Publishing, 1983.

**Course Description:**
Thermodynamic properties, system, ideal gas equation of state and compressibility factor, process, cycle and equilibrium. Control mass and control volume analysis. Properties and behavior of pure substances. First law of Thermodynamics. Steady state and transient processes and their application to thermodynamic systems and devices. Entropy and the Second law of thermodynamics. Simple steam power and vapor compression refrigeration cycles.

**Pre-requisites:** CE103 General Chemistry, MATH106 Calculus-II.
**Co-requisites:** None

**Course Learning Outcomes:**
With relation to ABET Student Outcomes (SOs: 1-7)

1. Understand and correctly use thermodynamic terminology (1)
2. Understand the properties and relationships of thermodynamic fluids (1)
3. Explain properties of solids, liquids, and vapors (1, 6)
4. Explain fundamental thermodynamic properties and units (6)
5. Define the meaning of the state of a working substance (1)
6. Define the concepts of heat, work, and energy (1)
7. Develop the General Energy Equation (1)
8. Use thermodynamic tables and diagrams (3)
9. Understand concepts of heat, work, and energy (1)
10. Discuss the use of boundaries in open and closed systems (1, 2, 3, 6)
11. Develop and apply the continuity equation for open and closed systems (1)

**Topics to be covered:**

- Introduction and thermodynamic concepts.
- Work, heat and their interaction with each other.
- Conservation of energy. (First law of thermodynamics)
- Pure substance and its phases, phase change processes and the P-v-T surface.
- Internal energy, enthalpy, use of thermodynamic property tables, ideal gas equation of state and compressibility factor.
- Closed system analysis: Moving boundary work, energy balance and specific heats.
- Internal energy, enthalpy and specific heats of ideal gases, solids and liquids.
- Open and steady flow system analysis: Conservation of mass. Flow work and flow energy.
- Examples of steady flow devices. Energy analysis of transient (unsteady flow) processes.
- Entropy
- The second law of thermodynamics and irreversibility.

**Grading Policy:**
The grading for the course are 60% coursework and 40% Final Exam. The course work consists of two Midterm Exams, where each midterm exam is worth 20%. It also includes quizzes, homework, class performance, and projects for the remaining 20% that is modified by the course instructor.