

ME 201

Thermodynamics

Course Learning Objectives

1. Basic Concepts

- a. Students can identify control volumes, closed systems, and transient systems
- b. Students can apply the state principle
- c. Students can work in different unit sets
- d. Students can identify intensive and extensive properties
- e. Students understand the concept of equilibrium
- f. Students can apply conservation of mass

2. Property Evaluation

- a. Students can recognize three types of substances: ideal gas, compressible substance, incompressible substance
- b. Students can use tables to evaluate the properties of compressible substances, including identifying the phase of the substance
- c. Students can use tables to evaluate the properties of ideal gases
- d. Students can use equations to evaluate the properties of compressible substances

3. First Law Analysis

- a. Students understand the principles of work and heat
- b. Students can calculate boundary work for a system from $\int PdV$
- c. Students understand the conservation of energy
- d. Students can apply the first law to closed systems
- e. Students can apply the first law to control volume systems
- f. Students can apply the first law to transient systems

4. Second Law Analysis

- a. Students understand and can calculate the thermal efficiency for a heat engine and the coefficient of performance for a refrigerator and heat pump
- b. Students understand the Clausius statement and the Kelvin-Planck statement of the second law
- c. Students understand the concept of reversibility
- d. Students understand the principle of the Carnot cycle and can make calculations of Carnot thermal efficiency and Carnot coefficient of performance
- e. Students understand the entropy property and can evaluate it for different types of substances
- f. Students can calculate and interpret the entropy change of the universe for a process
- g. Students can apply isentropic efficiencies for control volume work devices
- h. Students can calculate reversible work, irreversibility, and availability

5. Analysis of Thermodynamic Systems

- a. Students can perform calculations for steam power cycles
- b. Students can perform calculations for gas power and propulsion cycles
- c. Students can perform calculations for piston/cylinder power cycles
- d. Students can perform calculations for refrigeration cycles
- e. Students can perform calculations for psychrometric systems