CHAPTER 4: FIRST LAW OF THERMODYNAMICS

CHAPTER OUTLINE

1. Introduction

2. Energy and 1st law of thermodynamics postulate
   a. Cycle representation
   b. Process representation
   c. Energy definition
   d. 1st law postulate
   e. Examples of application (handout 4.1)
   f. Alternate form

3. Specific internal energy, enthalpy and heat capacity
   a. Specific internal energy definition and special cases
   b. Specific enthalpy definition and special cases
   c. Specific heat capacity definition and special cases

4. Application to ideal gases
   a. Internal energy, enthalpy and specific heat relationships
   b. Calorically perfect vs. calorically imperfect ideal gas (handout 4.2)
   c. Calculation methods for $u$ and $h$ during a process (handout 4.3)

5. Application to liquids and solids
   a. Incompressible materials (handout 4.4)
   b. General materials (handout 4.5)

CHAPTER OBJECTIVES

- Introduce the first law of thermodynamics, energy balances, and mechanisms of energy transfer
- Develop the general energy balance applied to closed systems
- Define the specific heat at constant volume and the specific heat at constant pressure
- Relate the specific heats to the calculation of the changes in internal energy and enthalpy of ideal gases
- Describe incompressible substances and determine the changes in their internal energy and enthalpy
- Solve energy balance problems for closed systems that involve heat and work interactions for general pure substances, ideal gases, and incompressible substances