

ADDIS ABABA UNIVERSITY

ADDIS ABABA INSTITUTE OF TECHNOLOGY

SCHOOL OF MECHANICAL AND INDUSTRIAL ENGINEERING

Course Title: *Engineering Thermodynamics*

Course No.: *MEng 2308*

Instructor: Fikadu G.

Course Objectives: The course enables students to:

- Understand the relationship between internal energy, heat and work as expressed by the First Law of Thermodynamics
- Apply the conservation of energy to thermodynamic systems
- State and explain the Second Law of Thermodynamics
- Explain how the Carnot cycle applies to heat engines and refrigeration cycles
- Explain the concept of entropy
- Explain basic thermodynamics cycles

Course Outline

1. *Introductory Concepts and Definitions*

- Introduction
- Closed, Open, and Isolated Systems
- State, Equilibrium, Process and Property
- Dimensions and Units
- Specific Volume, Pressure and Temperature

2. *Properties of Pure Substances*

- Pure substances
- Fixing the State of a Simple Pure Substance
- P-V-T Diagram
- Thermodynamic Property Tables
- Equation of State

3. *Energy Transport by Work, Heat and Mass*

- Energy of a System
- Energy Transport by Heat and Work
- Boundary Work
- Energy Transport by Mass

4. *The First Law of Thermodynamics and Energy*

- The First Law of a Closed System
- Specific Heats
- The First Law for a Control Volume
- Some Steady Flow Engineering Devices

5. *The Second Law of Thermodynamics*

- Some Basic Definitions
- Statements of the Second Law of Thermodynamics
- Perpetual Motion Machine
- Reversible and Irreversible Processes
- The Carnot Cycle
- The Thermodynamic Temperature Scale

6. *Consequence of 2nd Law of Thermodynamics: Entropy*

- Entropy and the Clausius Inequality
- Entropy and the Second Law of Thermodynamics
- Heat Transfer as the Area Under the T-s Curve
- Isothermal and Adiabatic Reversible Processes
- Isentropic Process of an Ideal Gas
- Isentropic Efficiencies of Turbines, Compressors, Pumps, and Nozzles

7. *Thermodynamics Cycles*

- Vapor Power Cycle
- Refrigeration and Heat Pumps
- Air-Standard Power Cycles

References:

- Cengel Y. A., Bole M.A. , “*Thermodynamics- An Engineering Approach*”, McGrawHill
- Michael J. Moran, H.N. Shapiro, “*Fundamental of Engineering Thermodynamics*”, John Wiley and Sons. Inc.
- Sonntag R.E., “*Fundamental of Thermodynamics*”, McGraw-Hill
- Eastop T.D. & A. McConkey A., “*Applied Thermodynamics*”
- R.E. Sonntag & G.L. Van Wylen, “*Introduction to Thermodynamics; Classical & Statistical*”

Evaluation:

Assignments I	15%
Quiz	10%
Intermediate Exam -1	15%
Intermediate Exam -2	10%
Final Examination	50%