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%