

In the name of God

Thermodynamics I

Course outline and study Guide

Textbook: Fundamentals of Thermodynamics (8th edition) by Claus Borgnakke, and Richard E. Sonntag.

Other References:

- Fundamental of Engineering Thermodynamics by M. J. Moran, and H. N. Shapiro

Course outline

| Week | Contents | Chapter |
|------|---|-----------|
| 1 | Introduction and Preliminaries | Chapter 1 |
| 2 | The Pure Substance, The Phase Boundaries, The P–v–T Surface, Tables of Thermodynamic Properties, The Two-Phase States, The Liquid and Solid States, The Superheated Vapor States, | Chapter 2 |
| 3 | The Ideal Gas States, The Compressibility Factor, Equations of State, Computerized Tables, Engineering Applications | |
| 4 | The Energy Equation, The First Law of Thermodynamics, The Definition of Work, Work Done at the Moving Boundary, | Chapter 3 |
| 5 | Definition of Heat, Heat Transfer Modes, Internal Energy, The Thermodynamic Property Enthalpy, Specific Heats, | |
| 6 | Ideal Gases, General Systems That Involve Work, Conservation of Mass, Engineering Applications | |
| 7 | Conservation of Mass and the Control Volume, The Energy Equation for a Control Volume, The Steady-State Process, Examples of Steady-State Processes | Chapter 4 |
| 8 | Multiple Flow Devices, The Transient Process, Engineering Applications | |
| 9 | Mid-term | |
| 10 | Heat Engines and Refrigerators, The Second Law of Thermodynamics, The Reversible Process, | Chapter 5 |
| 11 | Irreversible Processes, The Carnot Cycle, Efficiency of a Carnot Cycle, The Thermodynamic Temperature Scale, | |
| 12 | The Ideal-Gas Temperature Scale, Ideal versus Real Machines, Engineering Applications | |
| 13 | The Inequality of Clausius, Entropy, Entropy Change in Reversible Processes, The Thermodynamic Property Relation, Entropy Change of a Solid or Liquid, Entropy Change of an Ideal Gas, | Chapter 6 |
| 14 | Polytropic Process, Entropy Change of a Control Mass During an Irreversible Process, Entropy Generation, Principle of the Increase of Entropy, Entropy as a Rate Equation, Entropy and Chaos, | |
| 15 | The Second Law of Thermodynamics for a Control Volume, The Steady-State Process and the Transient Process, | Chapter 7 |
| 16 | Principle of the Increase of Entropy, Engineering Applications; Efficiency, | |

Marks:

- Homework (10%)
- Quiz (10%)
- Term-Exam (20%)
- Final Exam (60%)