

ME1100: Thermodynamics

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Instructor(s)

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General information

- 3 credit course
- 3 + 1 lecture+tutorial hours per week: ‘E2’ slot
 - Monday: 2:55–3:45 PM
 - Tuesday: 1:00–1:50 PM
 - Wednesday: 1:00–1:50 PM
 - Thursday: 3:50–4:40 PM
- Venue: CRC202
- Course materials on moodle courses.iitm.ac.in

Learning Outcomes

- Understand the basic principles of thermodynamics
- Apply these principles to systems of relevance to engineers

Syllabus

1. *Fundamentals concepts*
 - (a) System & Control volume
 - (b) Property, State & Process
 - (c) Exact & Inexact differentials
2. *Work*
 - (a) Concepts of thermodynamic and displacement work
 - (b) Work interactions in specific processes
3. *Temperature and heat*
 - (a) Thermal equilibrium
 - (b) Zeroth law of thermodynamics
 - (c) Difference between work and heat interactions
4. *First law for a system*
 - (a) Concept of total energy
 - (b) Various modes of energy
5. *Pure substance*
 - (a) Two property rule
 - (b) Enthalpy and internal energy
6. *Ideal gases and mixtures of ideal gases*
 - (a) Dalton's Law
 - (b) Amagot's law
7. *Properties of water-steam system*
 - (a) Constant temperature and constant pressure heating
 - (b) Saturated states
 - (c) Use of steam tables
8. *First law for flow processes*
 - (a) Steady flow process
 - (b) Unsteady flow process
9. *Second law of thermodynamics*
 - (a) Kelvin-Planck and Clausius statements
 - (b) Internal and external reversibilities
 - (c) Carnot cycle
 - (d) Absolute temperature scale
10. *Entropy*
 - (a) Clausius inequality
 - (b) Definition of Entropy
 - (c) TS relationships
 - (d) Entropy from steam tables
 - (e) Irreversibility, lost work, available and unavailable work
11. *Thermodynamic cycles*
 - (a) Rankine cycle
 - (b) Brayton cycle
 - (c) Vapor compression refrigeration cycle

Suggested Textbooks

- *Fundamentals of Thermodynamics*, Sonntag, Borgnakke, and Van Wylen, 2003, 6th Edition, John Wiley and Sons.
- *Fundamentals of Engineering Thermodynamics*, Moran and Shapiro, H. N, 1999, John Wiley and Sons.
- *Basic Engineering Thermodynamics*, P. K. Nag, 1995, Tata McGraw-Hill Publishing Co, Ltd
- *Basic Engineering Thermodynamics*, Venkatesh, A., 2007, University Press
- *Engineering Thermodynamics*, Spalding and Cole, 3rd edition, Edward Arnold (Publishers) Ltd
- *Thermodynamics, An Engineering approach*, Cengel and Boles, 5th edition, Edward Arnold (Publishers) Ltd

Grading Policy

- Assignments – 20%
- Quiz 1 – 20%
- Quiz 2 – 20%
- Final exam – 40%
- **Institute norm** – Attendance \geq 85%