

Review of basic thermodynamics: First & Second laws, Concept of entropy and entropy generation, Entropy balance for closed & open systems; Concept of exergy & irreversibility, Exergy analyses of open and closed system
Thermodynamic property relations: Maxwell relations; Relations involving enthalpy, internal energy and entropy; Mayer relation, Clausius-Clapeyron equation, Joule-Thompson experiment.

Properties of gas mixtures: Multi-component and multi-phase systems, Equations of states and properties of ideal and real gas mixtures, Change in entropy in mixing.

Irreversible thermodynamics: Finite time thermodynamic principle, Optimization of various thermodynamic systems, Principles of entropy generation minimization.

Thermodynamics of reactive systems: Combustion and thermochemistry, Reactant and product mixtures, Adiabatic flame temperature, Chemical equilibrium, Equilibrium products of combustion.

Chemical Kinetics: Global versus elementary reactions, Elementary reaction rates, Rates of reaction for multistep mechanisms.

Flames: Types of flames, Simplified analyses of premixed & diffusion flames, Factors influencing flame velocity and thickness, Quenching, flammability and ignition, Flame stabilization.

References

1. Adrian Bejan, Advanced Engineering Thermodynamics, John Wiley & Sons, 4th Edition, 2016.
2. Stephen R. Turns, An Introduction to Combustion: Concepts & Applications, McGraw-Hill Education, 3rd Edition, 2012.
3. Kenneth K. Kuo, Principles of Combustion, Wiley India Pvt. Ltd, 2nd Edition, 2012.
4. Michael J. Moran & Howard N. Shapiro, Fundamentals of Engineering Thermodynamics, John Wiley & Sons, 6th Edition, 2010.
5. Mark W. Zemansky & Richard H. Dittman, Heat & Thermodynamics, McGraw Hill, 8th Edition, 2017.