

1. **Mixture of Ideal Gases:** Introduction; Characteristic Gas Equation; Universal Gas Constant; Avogadro's Law; Gravimetric Analysis; Amagat-Leduc Law; Volumetric Analysis; Dalton's Law and Gibbs-Dalton Law; Adiabatic Mixing of Perfect Gases; Mixing of Ideal Gases Initially at Different Pressures and Temperatures; Problems on Mixture of Ideal Gases.
2. **Gas-Vapor Mixtures:** Introduction; The Dew Point; Relative Humidity; Humidity Ratio or Specific Humidity; Adiabatic Saturation Process; Wet-Bulb Dry-Bulb Temperatures; Processes of Gas-Vapor Mixtures; The Psychrometric Chart; Psychrometric Processes; Mixing of Air Streams; Sensible Heating and Cooling Processes; Cooling Tower; Types of Cooling Towers; Energy Analysis of a Cooling Tower; Problems on Gas-Vapor Mixtures
3. **Combustion:** Introduction; Fuels; Combustion Equation – Stoichiometry; Combustion Analysis; Mass Analysis; Volumetric Analysis; Excess Air; Molar Analysis of Combustion Problems; Experimental Analysis of Products of Combustion; Enthalpy of Formation; Adiabatic Flame Temperature; Heating Value of Fuels; Experimental Determination of Heating Values of Fuels; Dissociation; Problems on Combustion.
4. **Vapor-Power Cycles:** Introduction; The Carnot Cycle; The Rankine Cycle; The Rankine Cycle with Superheat; Efficiencies of Vapor-Power Cycle Processes; The Reheat Cycle; The Regenerative Cycle; The Regenerative-Reheat Cycle; Types of Feed-Water Heaters; Mollier Chart; Problems on Vapor-Power Cycles.
5. **Air-Standard Power Cycles:** Introduction; Mean Effective Pressure; The Air-Standard Otto Cycle; The Air-Standard Diesel Cycle; The Air-Standard Dual Combustion Cycle; The Stirling and Ericsson Cycles; The Brayton Cycle; Closed-Circuit Brayton Cycle; Open-Circuit Brayton Cycle; The Jet Propulsion Air-Standard Cycle; Gas-Turbine Cycle with Regenerator; Gas-Turbine Cycle with Intercooling and Reheating; Problems on Air-Standard Power Cycles.
6. **Introduction to Refrigeration:** Introduction; Refrigeration Effect and Unit of Refrigeration; The Vapor-Compression Refrigeration Cycle; Analysis of Vapor-Compression Refrigeration Cycle; Actual Vapor-Refrigeration Cycles; Effect of Sub-cooling the Refrigerant; Effect of Super-heating the Refrigerant; Vapor-Compression Cycle with Heat Exchanger; Use of Flash-Chamber in Vapor-Compression ; The Vapor-Absorption Cycle; Ammonia Absorption Refrigeration Cycle; Lithium-Bromide Absorption Refrigeration Cycle; Air Refrigeration Cycle; Problems on Refrigeration Cycles.
7. **Thermodynamic Relations:** Introduction; Fundamentals of Partial Derivatives; The Maxwell Relations; The Clapeyron Equation; Thermodynamic Relations Involving Entropy; Enthalpy and Internal Energy; van der Waals Equation of State for Real Gases; The Compressibility Factor and Corresponding States; Volume Expansivity; Isothermal and Adiabatic Compressibility; Relations Involving Specific Heats and Specific Heat; Joule Thomson Coefficient; Developing Tables of Thermodynamic Properties; Problems on Thermodynamic Relations.