1. **Introduction**: Definition; Simple steam power plant; Fuel cells; Thermoelectric generator; Thermoionic generators; Refrigerators and heat pumps; Thermoelectric refrigeration; Environmental concerns; Renewable energy.
2. **Some Introductory Concepts and Definitions:** Thermodynamic systems; Statistical thermodynamics; Property, state, process and equilibrium; Phase; Dimensions and units; Some basic properties of thermodynamics; The Zero law of Thermodynamics.
3. **Pure Substances:** Properties of pure substances; Pure substances; Equilibrium mixture of vapor-liquid-phase; Phase diagrams; Independent properties of pure substances; Thermodynamic property tables; Equation of state.
4. **Work and Heat:** Work; Units of work; Expansion and compression work; Other forms of work; Heat; Units of heat.
5. **The First Law of Thermodynamics and Energy:** The First Law and the system; The First Law and the control volume.
6. **The Second Law of Thermodynamics:** Basic concepts; Heat engines and Refrigerators; Statements of the Second Law of Thermodynamics; Reversible and irreversible processes; The Carnot cycle; The thermodynamic temperature scale; The ideal-gas thermometer; Equivalence of ideal-gas and thermodynamic temperature scales.
7. **Consequences of the Second Law of Thermodynamics and Entropy:** The Clausius inequality; Entropy as a property; System entropy change in a reversible process; The Tds equations; system entropy change in a irreversible process; change of entropy in solids and liquids; Change of entropy of ideal gases; Second Law of Thermodynamics and the control volume; The reversible work for a control volume; Principles of increase of entropy; Isentropic efficiencies.
8. **Availability and Irreversibility:** Introduction; System under going a steady state process; Control volume under going a steady state process; Control volume under going unsteady state process; Availability; Second law efficiency.