

**CORE COURSE IV - THERMAL PHYSICS AND STATISTICAL MECHANICS.**

**Unit I: Thermodynamics**

Zeroth law of thermodynamics – First law of thermodynamics – Heat engines – Reversible and irreversible process of Carnot's theorem – Second law of thermodynamics, Thermodynamic scale of temperature – Entropy – Change of entropy in reversible and irreversible processes – Temperature – entropy diagram (T.S) – Law of increase of entropy – Maxwell thermo dynamical relations – Clausius's Claypeyron's latent heat equations.

**Unit II: Low Temperature**

Joule – Thomson's effect – Porous plug experiment – Liquefaction of gases – Linde's method – Adiabatic demagnetization – Liquefaction of He – Practical applications of low temperature – Refrigerating mechanism – Air conditioning machines.

**Unit III : Radiation**

Radiation – Stefan's law Deduction of Newton's law from Stefan's law – Boltzmann law – Black body radiation – Wein's law – Rayleigh – Jean's law – Planck's law – Angstrom Pyroheliometer – Solar constant – Surface temperature of sun Sources of solar energy –Some everyday applications.

**Unit IV: Specific Heat**

Specific heat of solids – Einstein's theory of specific heat – Debye's theory – Specific heat of gases – Mayer's Relation – Quantization of various contributions to energy of diatomic molecules – Specific heat of diatomic gases – (Quantum Theory)

**Unit V: Statistical Physics**

Phase space – Statistical Equilibrium – Microstates and Macrostates – Maxwell – Boltzmann statistics – Application of M.B statistics to molecular energies in an ideal gas – B-E statistics- Application of B-E statistics to photon gases – F-D statistics – Application of F.D statistics to electron gas – Comparison of three statistics.

**Books for Study:**

1. Brij lal, and Subramaniam, Heat and Thermodynamics, S.Chand & Co. (2007)
2. J.B.Rajam and C.L Arora, Heat and Thermodynamics.