

CNNKGF 'EQWTUG'RCRGT-4: THERMAL PHYSICS

Laws of Thermodynamics:

Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_p & C_v , Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient, Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero. (22 Lectures)

Thermodynamical Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for ($C_p - C_v$), C_p/C_v , TdS equations. (10 Lectures)

Kinetic Theory of Gases: Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases. (10 Lectures)

Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law. (6 Lectures)

Reference Books:

- Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.
 - A Treatise on Heat, Meghnad Saha, and B.N. Srivastava, 1969, Indian Press.
 - Thermodynamics, Enrico Fermi, 1956, Courier Dover Publications.
 - Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears & G.L.Salinger. 1988, Narosa
 - University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
-

PHYSICS LAB.1: THERMAL PHYSICS LAB.

(Students have to perform at least 5 experiments. Additional experiments may be included with the approval of the committee of courses)

1. To determine Stefan's Constant.
2. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus.
3. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.
4. To determine the temperature co-efficient of resistance by Platinum resistance thermometer.
5. To study the variation of thermo emf across two junctions of a thermocouple with temperature.
6. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system
7. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge

Reference Books:

- Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
 - Practical Physics, C.L Arora, 2001, S. Chand and Co.
 - B.Sc. Practical Physics, Geeta Sanon, 2009, R. Chand and Co.
 - A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
 - A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal, 1985, Vani Publication.
-