Semester - III (Core Course)	PHY320C: PHYSICS: THERMAL PHYSICS	Theory
04 Credits		60 Hours

Unit - I

Kinetic Theory of Gases: Basic assumptions of kinetic theory, Classical theory of heat capacities, Distribution of velocities in a perfect gas.

Mean free path and transport phenomena: Mean free path, Transport Phenomena, Brownian motion, Random walk problem.

Imperfect gases and van der Wall's equation: Derivation of perfect gas behaviour, Onnes equation of state, van der Wall's equation of state, Reduced equation of state.

Unit - II

Entropy: Entropy change in reversible processes, The inequality of Clausius, Entropy change in irreversible processes, The principle of increase of entropy, The entropy form of the first law.

Thermodynamic relations: The Maxwell relations, Thermodynamic relations involving heat capacities, The Tds equations, The energy density of equilibrium radiation, Wien's law.

Free energies and thermodynamic equilibrium: General condition for natural change, Free energies and Maxwell's relations, General conditions for thermodynamic equilibrium.

Unit - III

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.

Unit - IV

Statistical Mechanics: Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law - distribution of velocity. Quantum statistics - Fermi-Dirac distribution law - electron gas – Bose-Einstein distribution law - photon gas - comparison of three statistics.

Text Books:

1. *Thermal Physics by S C Garg, R M Bansal and C K Ghosh*
2. *Concepts of Modern Physics by Arthur Beiser.*

Reference Books:

1. *Heat and Thermodynamics, M.W.Zemasky and R. Dittman*
2. *Thermodynamics, Kinetic theory & Statistical thermodynamics, F.W.Sears & G. L. Salinger.*

Semester - III (Core Course)	PHY320C: PHYSICS: THERMAL PHYSICS	Practical
02 Credits		60 Hours

1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.
2. Measurement of Planck's constant using black body radiation.
3. To determine Stefan's Constant.
4. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus.
5. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
6. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.
7. To determine the temperature co-efficient of resistance by Platinum resistance thermometer.
8. To study the variation of thermo emf across two junctions of a thermocouple with temperature.
9. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system
10. To calibrate Resistance Temperature Device (RTD) using Null Method/Off- Balance Bridge
11. To study probability distributions using dices/coins.

Reference Books:

1. *Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop,*
2. *A Text Book of Practical Physics, Indu Prakash and Ramakrishna*
3. *A Laboratory Manual of Physics for Undergraduate Classes, D.P. Khandelwal*
4. *Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn*