LESSON PLAN-2025-26(ODD SEMESTER)

Name of the Assistant/ Associate Professor: Dr. Deepa
Class and Section: B.Sc. II Physical Sciences, 3rd semester
Subject: Physics Minor (Thermal Physics)

Month	Dates	Topics Proposed to be covered
1	22-07-25 To 31-08-25	**Zeroth and First Law of Thermodynamics:** Extensive and intensive thermodynamic variables, Thermodynamic equilibrium, zeroth law and Concept of Temperature, Work and heat, State functions, First law of thermodynamics, Internal energy, Applications of first law, General relation between Cp and Cv, Work done during isothermal and adiabatic processes. **Second Law of Thermodynamics:** Reversible and Irreversible processes with examples, Conversion of Work into Heat and Heat into Work, Heat Engines, Carnot's Cycle, Carnot engine and its efficiency, 2nd Law of Thermodynamics, Kelvin-Planck and Clausius statements and their equivalence, Carnot's theorem.
2	01-09-25 To 30-09-25	**Entropy and Third law of Thermodynamics:** Concept of entropy, Clausius theorem, Clausius inequality, Second Law of Thermodynamics in terms of Entropy, Entropy of a Perfect Gas and Universe, Entropy Changes in Reversible and Irreversible Processes, Principle of increase of Entropy, Third Law of Thermodynamics, Unattainability of absolute zero, T-S Diagrams, Phase change, Classification of Phase changes.
3	01-10-25 To 31-10-25	**Thermodynamic Potentials:** Internal Energy; Definition, importance, properties and applications of Chemical Potential, Enthalpy, Gibb's function and Helmholtz's function. **Maxwell's Thermodynamic Relations:** Derivations of Maxwell's relations and their applications: (i) Clausius-Clapeyron equation (ii) C_p- C_v value (iii) Energy equations (iv) Change of temperature during adiabatic process.
4	01-11-25 To 20-11-25	**Real gases:** Behavior of real gases, Deviations from the ideal gas equation, The Virial equation, Critical constants. Continuity of liquid and gaseous state. Vapour and Gas, Boyle Temperature, Van-der Waal's equation of state for real gases. Values of Critical Constants. Law of corresponding states, Comparison with Experimental Curves, P-V Diagrams, Joule's Experiment, Free adiabatic expansion of a perfect gas.

LESSON PLAN-2025-26 (ODD SEMESTER)

Name of the Assistant/ Associate Professor: Dr. Deepa
Class and Section: B.Sc. II Physical Sciences, 3rd semester
Subject: Physics Major (Thermodynamics & Statistical Physics)

Month	Dates	Topics Proposed to be covered
1	22-07-25 To 31-08-25	**THERMODYNAMICS-I** Thermodynamic-systems, variables and equation of state, thermal equilibrium, Zeroth law of thermodynamics; Concept of heat, work and its sign (work done- by the system on the system) & its path dependence, First law of thermodynamics- its significance and limitations, internal energy as a state function, different types of process-isochoric process, isobaric process, adiabatic process, isothermal process, cyclic process, Reversible and irreversible process, First law and cyclic process; Second law of thermodynamics and its significance, Carnot theorem; Absolute scale of temperature, Absolute Zero and magnitude of each division on work scale and perfect gas scale, Joule's free expansion, Joule Thomson effect, Joule-Thomson (Porous plug) experiment, conclusions and explanation, analytical treatment of Joule Thomson effect, Entropy, calculations of entropy of reversible and irreversible process, T-S diagram, entropy of a perfect gas, Nernst heat law (third law of thermodynamics); Liquefaction of gases, (oxygen, air, hydrogen and helium) solidification of helium below 4K, Cooling by adiabatic demagnetization
2	01-09-25 To 30-09-25	**THERMODYNAMICS-II** Derivation of Clausius-Clapeyron and Clausius latent heat equations and their significance, specific heat of saturated vapours, phase diagram and triple point of a substance, development of Maxwell thermodynamical relations, Thermodynamical functions: Internal energy (U), Helmholtz function (F), Enthalpy (H), Gibbs function (G) and the relations between them, derivation of Maxwell thermodynamical relations from thermodynamical functions, Application of Maxwell relations: relations between two specific heats of gas, Derivation of Clausius- Clapeyron and Clausius equation, variation of intrinsic energy with volume for (i) perfect gas (ii) Vander wall gas (iii) solids and liquids, derivation of Stefan‟s law, adiabatic compression and expansion of gas & deduction of theory of Joule Thomson effect.
3	01-10-25 To 31-10-25	**STATISTICAL PHYSICS-I** Distribution of N (for N= 2, 3, 4) distinguishable and indistinguishable particles in two boxes of equal size, microstates and macrostates, thermodynamical probability, constraints and accessible states, statistical fluctuations, general distribution of distinguishable particles in compartments of different sizes, β-parameter, entropy and probability; Concept of phase space, division of phase space into cells, postulates of statistical mechanics; Classical and quantum statistics, basic approach to these statistics, Maxwell-Boltzmann statistics applied to an ideal gas in equilibrium-energy distribution law, Maxwell's distribution of speed & velocity (derivation required), most probable speed, average and r.m.s. speed, mean energy for Maxwellian distribution.
4	01-11-25 To 20-11-25	**STATISTICAL PHYSICS-II** Dulong and Petit Law, derivation of Dulong and Petit law from classical physics; Need of Quantum statistics- classical versus quantum statistics, Bose-Einstein energy distribution Law, Application of B. E. Statistics to Planck's radiation law, degeneracy and B. E. condensation; Fermi-Dirac energy distribution Law, F. D. gas and degeneracy, Fermi energy and Fermi temperature; F. D. energy distribution Law for electron gas in metals, zero point energy, average speed (at 0 K) of electron gas.

LESSON PLAN-2025-26 (ODD SEMESTER)

Name of the Assistant/ Associate Professor: Dr. Deepa
Class and Section: B.A. II, 3rd semester
Subject: MDC Physics (Elements of Modern Physics)

Month	Dates	Topics Proposed to be covered
1	22-07-25 To 31-08-25	Basics of semiconductor and semiconductor devices-Atomic structure and energy levels, energy bands (basic idea), definition of conductor, semiconductor and insulators (on the basis of energy gap), Intrinsic semiconductors, extrinsic semiconductors-p-type and n-type semiconductor), P-N junction diode-depletion layer, forward biasing and reverse biasing, V-I characteristics; Principle, working and applications of Zener diode, Photodiode, Solar cell and Light emitting diode (LED); Basic idea of transistors, semiconductors in computers-integrated circuits
2	01-09-25 To 30-09-25	Basics of Laser systems - introduction to LASER, important properties of laser light, Principle of laser- Light amplification, population inversion and pumping; Working of laser- schematic diagram for functioning of laser, m three level and four level Laser systems; applications of Lasers in different fields of science and technology. Basics of fiber optics- introduction to optical fibers, total internal reflection and the optical fibers, structure and types of optical fiber (basic idea), advantages and disadvantages of optical fibers, optical fiber communication system (basic idea), applications of optical fibers.
3	01-10-25 To 31-10-25	Introduction to nuclear physics- the atomic nucleus and the nucleons, atomic number, mass number, isotopes, isobars and isotones; nuclear binding energy, natural radioactivity and radioactive decay- α, β, and γ- decay; Laws of radioactivity, decay constant, relative activity, half life, average life, radioisotopes, carbon dating and other applications of radioactive isotopes; Nuclear fission reaction and its application as a source of energy (nuclear reactor) and hazardous aspect of nuclear fission; Nuclear fusion reaction and source of stellar energy
4	01-11-25 To 20-11-25	Magnetic Materials- Introduction, classification and applications of magnetic materials; Piezoelectricity and applications of Piezoelectric materials; Ceramics and polymers and their applications; Superconductors and their applications; Nanomaterials - Introduction to nanomaterials, extraordinary properties of nanomaterials, applications and limitations of nanotechnology