Lesson Plan

Dr. Manjeet Singh
Assistant Professor of Physics

Subject	**Physics**
Semester	**5th**
Name of the Course	**Modern Physics**
Course Code	**B23-PHY-501**
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC/AEC/VA C)	**CC/MCC**
Credits : 04	**Theory Credits : 03** **Practical Credits : 01**

	Topics
August 2025	**Introductory Quantum Mechanics:** Need of Quantum Mechanics, Planck's quantum hypothesis and Black body Radiation (Qualitative only), photoelectric effect, Compton effect, de-Broglie hypothesis, de-Broglie wave, wave packet, phase and group velocities, Time-dependent and time- independent Schrodinger equations, Properties of wave function, particle confined in a one-dimensional infinite box: energy eigen functions and eigenvalues. Heisenberg's Uncertainty Principle (Qualitative Idea)
September 2025	**Solid State Physics:** Crystalline state, crystal lattice, basis, lattice translation vectors, primitive and non-primitive unit cells, Bravais lattices in two and three dimensions, Miller Indices, crystallographic planes, interplanar spacing, simple crystal structures: NaCl, diffraction of waves by crystals, Bragg's law, Idea of Reciprocal Lattice.
October 2025	**Atomic and Molecular Physics:** Bohr model, Sommerfeld theory (qualitative), Larmor's theorem (qualitative), Vector Atom Model, electron spin, space quantization, spin-orbit Interaction energy, LS and JJ coupling, Zeeman effect, Lande's g-factor.
November 2025	**Nuclear and Particle Physics:** Composition of nucleus, stability of nucleus, nuclear properties, nuclear size, spin, parity, magnetic moment, quadrupole moment, binding energy of nucleus, Semi- empirical Mass formula, classification of fundamental particles, Quark and Lepton,Hadrons, Baryons, Mesons, different types of nuclear inteactions.

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Subject	**Physics**
Semester	**3rd**
Name of the Course	**Thermodynamics & Statistical Physics**
Course Code	**B23-PHY-301**
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC /AEC/VA C)	**CC/MCC**
Credits : 04	**Theory Credits : 03** **Practical Credits : 01**

	Topics
August 2025	**THERMODYNAMICS-I** Laws of Thermodynamics: Thermodynamic Description of system: Zeroth Law of thermodynamics. First law of thermodynamics and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient, Reversible and irreversible processes, Second law of thermodynamics, Entropy, Carnot's cycle & Carnot's theorem, Entropy changes in reversible and irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.
September 2025	**THERMODYNAMICS-II** Thermodynamic Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations and applications - Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for (CP – CV), CP/CV, TdS equations.
October 2025	**Statistical Physics-I** Basics idea of probability, Priori probability, Statistical probability, permutation and combination, distinguishable and indistinguishable particles 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, 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.
November 2025	**Statistical Physics-II** Need of Quantum statistics- classical versus quantum statistics, Bose Einstein energy distribution Law, Application of B. E. Statistics to Planck's radiation law, Fermi-Dirac energy distribution Law, 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

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Subject	Physics
Semester	1st
Name of the Course	Mechanics
Course Code	B23-PHY-101
Course Type: (CC/MCC/MDC/CC-M/DSEC/VOC/DSE/PC /AEC/VA C)	CC/MCC
Credits : 04	Theory Credits : 03 Practical Credits : 01

	Topics
August 2025	**Fundamentals of Dynamics:** Rigid body, Moment of Inertia, Radius of Gyration, Theorems of perpendicular and parallel axis (with proof), Moment of Inertia of ring, Disc, Angular Disc, Solid cylinder, Solid sphere, Hollow sphere, Rectangular plate, Square plate, Solid cone, Triangular plate, Torque, Rotational Kinetic Energy, Angular momentum, Law of conservation of angular momentum, Rolling motion, condition for pure rolling, acceleration of body rolling down an inclined plane, Fly wheel, Moment of Inertia of an irregular body.
September 2025	**Elasticity:** Deforming force, Elastic limit, stress, strain and their types, Hooks law, Module of elasticity Relation between shear angle and angle of twist, elastic energy stored/volume in an elastic body, Elongation produced in heavy rod due to its own weight and elastic potential energy stored in it, Poisson's ratio and its limiting value, Relation between Young modulus, Bulk modulus and Poisson ratio. Derive the Relation between Young's modulus, Bulk modulus and Modulus of rigidity. Torque required for twisting cylinder, Bending of beam, bending moment and its magnitude, Bending of cantilever (loaded by a weight W at its free end), weight of cantilever uniformly distributed over its entire length. Dispersion of a centrally loaded beam supported at its ends, determination of elastic constants for material of wire by Searle's method.
October 2025	**Special Theory of Relativity:** Michelson's Morley experiments and its outcome, Postulate of special theory of relativity, Lorentz Transformation, Simultaneity and order of events, Lorentz contraction, Time dilation, Relativistic transformation of velocity, relativistic addition of velocities, variation of mass-energy equivalence, relativistic Doppler effect.
November 2025	**Gravitation and central force motion:** Law of gravitation, Potential and field due to spherical shell and solid sphere. Motion of a particle under central force filed, Two body problem and its reduction to one body problem and its solution, determination of g by means of bar pendulum, Normal coordinates and normal modes, Normal modes of vibration for given spring mass system, possible angular frequencies of oscillation of two identical simple pendulums of length (l) and small bob of mass (m) joined together with spring of spring constant (k.)

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