Lesson Plan 2025-26 (Odd Semester)

(July 2025 to November 2025)

Subject: DSC- Physics (Mechanics and Theory of Relativity)

Class: B.Sc (Physical Sciences) (Sem:- I)

Name: Dr. Neha Aggarwal
Department: Physics

MONTH	TOPICS TO BE COVERED
JULY	Basics of Mechanics: Mechanics of single and system of particles, Conservation law of linear momentum, Angular momentum and mechanical energy for a particle and a system of particles, Centre of Mass and equation of motion, Constrained Motion. Work and Kinetic Energy Theorem. Conservative and neoconservative forces.
AUGUST	Potential Energy. Energy diagram. Stable and unstable equilibrium. Elastic potential energy. Force as gradient of potential energy. Work & Potential energy. Work done by non-conservative forces. Law of conservation of Energy. Generalized Notations: Degrees of freedom and Generalized coordinates, Transformation equations, Generalized Displacement, Velocity, Acceleration, Momentum, Force and Potential, Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems. Hamilton's variational principle, Lagrange's equation of motion from Hamilton's principle, Linear Harmonic oscillator, Simple pendulum, Atwood's machine.
SEPTEMBER	Rotational Dynamics: Rotation of Rigid body, moment of inertia, torque, angular momentum, kinetic energy of rotation. Theorems of perpendicular and parallel axes with proof. Moment of inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross-section. Acceleration of a body rolling down on an inclined plane. Kinetic energy of rotation. Motion involving both translation and rotation.
OCTOBER	Special Theory of Relativity: Non-inertial frames and fictitious forces. Uniformly rotating frame. Laws of Physics in rotating coordinate systems. Centrifugal force. Coriolis force and its applications. Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations. Simultaneity and order of events. Lorentz contraction. Time dilation. Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence.
NOVEMBER	Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum. Energy-Momentum Four Vector. Revision.

Lesson Plan 2025-26 (Odd Semester)

(July 2025 to November 2025)

Subject: DSC- Physics (Optics)

Class: B.Sc (Physical Sciences) (Sem:- III)

Name: Dr. Neha Aggarwal
Department: Physics

MONTH	TOPICS TO BE COVERED
JULY	INTERFERENCE: Interference by Division of Wave front: Young's double slit experiment, Coherence, Conditions of interference, Fresnel's biprism and its applications to determine the wavelength of sodium light and thickness of a mica sheet, phase change on reflection.
AUGUST	Interference by Division of Amplitude: Plane parallel thin film, production of colours in thin films, classification of fringes in films, Interference due to transmitted light and reflected light, wedge shaped film, Newton's rings DIFFRACTION Fresnel's diffraction: Huygens-Fresnel's theory, Fresnel's assumptions, rectilinear propagation of light, diffraction at a straight edge, rectangular slit and diffraction at a circular aperture. Fraunhoffer diffraction: Single slit diffraction, double slit diffraction, plane transmission grating spectrum, dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating.
SEPTEMBER	POLARIZATION: Polarisation by reflection, refraction and scattering, Malus Law, Phenomenon of double refraction, Huygens's wave theory of double refraction (Normal and oblique incidence), Analysis of polarized Light. Nicol prism, Quarter wave plate and half wave plate, production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii) Elliptically polarized light. Optical activity, Fresnel's theory of optical rotation, Specific rotation, Polarimeters (half shade and Biquartz)
OCTOBER	LASERS: Basic concept of absorption and emission of radiations, amplification and population inversion; Main components of lasers: (i) Active Medium (ii) Pumping (iii) Optical Resonator; Properties of laser beam: Monochromaticity, Directionality, Intensity, Coherence (Spatial & Temporal coherence); Metastable state, Excitation mechanism and Types of Lasers (He-Ne Laser & Ruby Laser), Applications of Lasers. FIBRE OPTICS: Optical fibres and their properties, Principal of light propagation through a optical fibre, Acceptance angle and numerical aperture.
NOVEMBER	Types of optical fibres: Single mode and multimode fibres, Advantages and Disadvantages of optical fibres. Revision.

Lesson Plan 2025-26 (Odd Semester)

(July 2025 to November 2025)

Subjects: 1. Solid State Physics and 2. Quantum Mechanics

Class: B.Sc (Non-Medical) (Sem:- V)

Name: Dr. Neha Aggarwal
Department: Physics

MONTH	TOPICS TO BE COVERED
JULY	**Quantum Mechanics:** Failure of (Classical) E.M. Theory. quantum theory of radiation (old quantum theory), Photon, photoelectric effect and Einstein's photoelectric equation.
AUGUST	Compton Effect, Inadequacy of old quantum theory, de-Broglie hypothesis. Davisson and Germer experiment. G.P. Thomson experiment. Phase velocity group velocity, Heisenberg's uncertainty principle. Time-energy and angular momentum, position uncertainty Uncertainty principle from de-Broglie wave, (wave-particle duality). Gamma Ray Microscope, Electron diffraction from a slit. Derivation of time dependent Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance. Normalization of wave function, concept of observable and operator. Solution of Schrodinger Equation for harmonic oscillator ground states and excited states.
SEPTEMBER	Application of Schrodinger equation in the solution of the following one-dimensional problems: Free particle in one dimensional box (solution of Schrodinger wave equation, eigen function, eigen values, quantization of energy and momentum, nodes and antinodes, zero-point energy). i) One-dimensional potential barrier $E>V_0$ (Reflection and Transmission coefficient. ii) One-dimensional potential barrier, $E>V_0$ (Reflection Coefficient, penetration of leakage coefficient, penetration depth). **Solid State Physics:** Crystalline and glassy forms, liquid crystal. Crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and primitive cell, Wigner-Seitz primitive cell.
OCTOBER	Bravais lattices in two and three dimensions. Crystal planes and Miller indices, Inter-planar spacing, crystal structures of Zinc Sulphide, Sodium Chloride and Diamond, X-ray diffraction, Bragg's law and experimental X-ray diffraction methods, K-space. Reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, bcc and fcc.
NOVEMBER	Specific heat: Specific heat of solids, Einstein's theory of specific heat, Debye model of specific heat of solids. Revision.