LESSON PLAN - 1

Name of Teacher – Dr. Surender Kumar Subject – Physics

Paper – Electricity, Magnetism and EM Theory

Class: B.Sc. Semester - II Session: 2024-25

Week	Contents
Week 1	Unit-1 Gradient of a scalar and its physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance
Week 2	Electromagnetic Waves: Electromagnetic waves, Transverse nature of electromagnetic wave
Week 3	Derivation of Laplace and Poisson equations. Electric flux, Gauss Law
Week 4	Differential form of Gauss law. Mechanical force of charged surface.
Week 5	Unit-2 Biot-Savart law and its simple applications: straight wire and circular loop, Current Loop as a Magnetic Dipole and its Dipole Moment
Week 6	Circuital Law and its applications to 1) Solenoid 2) Toroid
Week 7	Magnetic Properties of Matter: Force on a dipole in an external field, Electric currents in Atoms, Electron spin and Magnetic moment, types of magnetic materials, Magnetization vector (M)
Week 8	Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H and M, Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin theory).
Week 9	Test of Unit-1 and 2
Week 10	Unit-3 Time varying electromagnetic fields: Electromagnetic induction, Faraday's laws of induction
Week 11	Lenz Law, Self-inductance, Mutual inductance, Energy stored in a Magnetic field
Week 12	Derivation of equations, Displacement current
Week 13	Maxwell's equations in differential and integral form and their physical significance.
Week 14	Unit-4 Electromagnetic Waves: Electromagnetic waves, Transverse nature of electromagnetic wave
Week 15	Energy transported by electromagnetic waves and related numericals
Week 16	Poynting vector and Poynting theorem.
Week 17	Numericals related to EM Waves
Week 18	Test of Unit 3 and 4
Week 19	Revision of Syllabus

Surender 13/4/2025

(Dr. SURENDER KUMAR)

Assistt. Professor (Physics)

LESSON PLAN - 2

Name of Teacher – Dr. Surender Kumar	Subject – Physics
Paper – Wave and Optics	
Class: B.Sc. Semester - IV	Session: 2024-25

Week	Contents
Week 1	Unit-1 INTERFERENCE : Interference by Division of Wave front: Young's Double Slit experiment, Coherence, Conditions of Interference
Week 2	Fresnel's biprism and its applications to determine the wavelength of sodium light and thickness of a mica sheet, phase change on reflection.
Week 3	Interference by Division of Amplitude: Plane parallel thin film, production of colors in thin films
Week 4	Classification of fringes in thin films, Interference due to transmitted light and reflected light, wedge shaped film, Newton's rings.
Week 5	Unit-2 DIFFRACTION: Fresnel Diffraction: Half-period zones. Zone plate
Week 6	Fresnel Diffraction: pattern of a straight edge, a slit and a wire using half-period zone analysis.
Week 7	Fraunhoffer diffraction: Single slit diffraction, double slit diffraction, plane transmission grating spectrum
Week 8	Dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of telescope and grating.
Week 9	Test of Unit-1 and 2
Week 10	Unit-3 POLARIZATION : Polarization: Polarisation by reflection, refraction and scattering, Malus Law, Phenomenon of double refraction
Week 11	Huygen's wave theory of double refraction (Normal and oblique incidence), Analysis of polarized Light. Nicol prism
Week 12	Quarter wave plate and half wave plate, production and detection of (i) Plane polarized light (ii) Circularly polarized light
Week 13	(iii) Elliptically polarized light. Qualitative idea of optical rotation and Polarimeters.
Week 14	Unit-4 Lasers: Basic concept of absorption and emission of radiations, amplification and population inversion
Week 15	Main components of lasers: (i) Active Medium (ii) Pumping (iii) Optical Resonator; Properties of laser beam
Week 16	Monochromaticity, Directionality, Intensity, Coherence (Spatial & Temporal coherence); Metastable state
Week 17	Excitation mechanism and Types of Lasers (He-Ne Laser & Ruby Laser), Applications of Lasers
Week 18	Test of Unit 3 and 4
Week 19	Revision of Syllabus

(DR. SURENDER KUMAR)
Asstt. Professor (Physics)

LESSON PLAN - 3

Name of Teacher – Dr. Surender Kumar Subject – Physics
Paper I – Solid State and Nano Physics
Class: B.Sc. Semester - VI Session: 2024-25

Week	Contents
Week 1	Unit-1 Crystal Structure I Crystalline and glassy forms, liquid crystals, crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and Primitive Cell
Week 2	Wigner Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions. Crystal planes and Miller indices, Interplaner spacing
Week 3	Crystal structures of Zinc Sulphide, Sodium Chloride and Diamond Numerical Problems. Unit II: Crystal Structure II X ray diffraction, Bragg's Law and experimental X ray diffraction methods
Week 4	K space and reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c.
Week 5	Test of Unit-1 and 2
Week 6	Unit III: Super conductivity : Historical introduction, Survey of superconductivity, Super conducting systems, High Tc Super conductors, Isotopic Effect, Critical Magnetic Field, Meissner Effect, London Theory and Pippards' equation
Week 7	Classification of Superconductors (type I and Type II), BCS Theory of Superconductivity, Flux quantization,Josephson Effect (AC and DC), Practical Applications of superconductivity and their limitations, power application of superconductors.
Week 8	Unit IV: Introduction to Nano Physics Definition, Length scale, Importance of Nano scale and technology, History of Nanotechnology, Benefits and challenges in molecular manufacturing. Molecular assemesterbler concept
Week 9	Understanding advanced capabilities. Vision and objective of Nanotechnology, Nanotechnology in different field, Automobile, Electronics, Nano-biotechnology, Materials, Medicine
Week 10	Test of Unit 3 and 4

13/2/2025
(DR. SURENDER KUMAR)
Asstt. Professor (PHYSICS)

LESSON PLAN - 4

Name of Teacher – Dr. Surender Kumar Subject – Physics
Paper 2 – Atomic and Molecular Spectroscopy
Class: B.Sc. Semester - VI Session: 2024-25

Week	Contents
Week 11	**Unit-1** Unit – I: Historical background of atomic spectroscopy Introduction of early observations, emission and absorption spectra, atomic spectra, wave number, spectrum of Hydrogen atom in Balmer series, Bohr atomic model (Bohr's postulates), spectra of Hydrogen atom , explanation of spectral series in Hydrogen atom, unquantized states and continuous spectra, spectral series in absorption spectra, effect of nuclear motion on line spectra (correction of finite nuclear mass), variation in Rydberg constant due to finite mass.
Week 12	Short comings of Bohr's theory, Wilson sommerfeld quantization rule, deBroglie interpretation of Bohr quantization law, Bohr's corresponding principle, Sommerfeld's extension of Bohr's model, Sommerfeld relativistic correction, Short comings of BohrSommerfeld theory, Vector atom model; space quantization, electron spin, coupling of orbital and spin angular momentum, spectroscopic terms and their notation, quantum numbers associated with vector atom model,transition probability and selection rules.
Week 13	**Unit –II:** Vector Atom Model (single valance electron) Orbital magnetic dipole moment (Bohr megnaton), behavior of magnetic dipole in external magnetic filed; Larmors' precession and theorem. Penetrating and Nonpenetrating orbits, Penetrating orbits on the classical model; Quantum defect
Week 14	spin orbit interaction energy of the single valance electron, spin orbit interaction for penetrating and nonpenetrating orbits. quantum mechanical relativity correction, rogen fine spectra, Main features of Alkali Spectra and their theoretical interpretation, term series and limits, RydeburgRitze combination principle, Absorption spectra of Alkali atoms. observed doublet fine structure in the spectra of alkali metals and its Interpretation, Intensity rules for doublets, comparison of Alkali spectra and Hydrogen spectrum .
Week 15	Test of Unit 1 and 2
Week 16	**UNIT-III:** Vector Atom model (two valance electrons)Essential features of spectra of Alkalineearth elements, Vector model for two valance electron atom: application of spectra. Coupling Schemes;LS or Russell – Saunders CouplingScheme and JJ coupling scheme, Interaction energy in LS coupling (sp, pd configuration), Lande interval rule, Pauli principle and periodic classification of the elements. Interaction energy in JJ Coupling (sp, pd configuration), equivalent and nonequivalent electrons, Two valance electron systemspectral terms of nonequivalent and equivalent electrons, comparison of spectral terms in LS And JJ coupling.
Week 17	Hyperfine structure of spectral lines and its origin; isotope effect, nuclear spin. **Unit –IV:** Atom in External Field Zeeman Effect (normal and Anomalous),Experimental setup for studying Zeeman effect, Explanation of normal Zeeman effect(classical and quantum mechanical), Explanation of anomalous Zeeman effect(Lande gfactor), Zeeman pattern of D1 and D2 lines of Na atom
Week 18	PaschenBack effect of a single valence electron system. Weak field Stark effect of Hydrogen atom. Molecular Physics General Considerations, Electronic States of Diatomic Molecules, Rotational Spectra (Far IR and Microwave Region), Vibrational Spectra (IR Region), Rotator Model of Diatomic Molecule, Raman Effect, Electronic Spectra.
Week 19	Revision of Syllabus

(Dr. SURENDER KUMAR)
Asstt. Professor (Physics)