Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2024-25** **Semester: Even**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 6th Semester)
Name of Subject: Solid State and Nano Physics (Physics-PH-601)

Jan 2025 to April 2025	
	Month (Jan)
Week 1	**Unit I: 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, Winger Seitz primitive Cell,
Week 2	Symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions. Crystal planes and Miller indices, Interplaner spacing, Crystal structures of Zinc Sulphide, Sodium Chloride and Diamond.
Week 3	**Unit II: Crystal Structure II** X-ray diffraction, Bragg's Law and experimental X-ray diffraction methods. 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.
	Month (Feb)
Week 4	**Unit III: Super conductivity** Historical introduction, Survey of superconductivity, Super conducting systems, High Tc Super conductors, Isotopic Effect, Critical Magnetic Field, Meissner Effect,
Week 5	London Theory and Pippards' equation, Classification of Superconductors (type I and Type II),BCS Theory of Superconductivity, Flux quantization,
Week 6	Josephson Effect (AC and DC), Practical Applications of superconductivity and their limitations, power application of superconductors.
Week 7	**Unit IV: Introduction to Nano Physics** Definition, Length scale, Importance of Nano-scale and technology, History of Nantechnology.Benefits and challenges in molecular manufacturing.
	Month (March)
Week 8	Molecular assembler concept, Understanding advanced capabilities. Vision and objective of Nano-technology,
Week 9	Nanotechnology in different field, Automobile, Electronics, Nano-biotechnology, Materials, Medicine.
	Month (April) **Revision, Assignment and Test**

Text and Reference Books:

1 C. Kittel, *Introduction to Solid State Physics*, 7th Ed (1996) John Wiley & Sons, New Delhi.
2. Pillai O S, *Solid State Physics*, New Age International Publishers (2007) New Delhi
3. Kachhava C M, Solid State Physics (1990) Tata Mc Graw Hill Co Ltd, New Delhi

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Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2024-25** **Semester: Even**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 6th Semester)
Name of Subject: Atomic and Molecular Spectroscopy(Physics-PH-602)

Jan 2025 to April 2025	
	Month (Jan)
Week 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, un-quantized states and continuous spectra, spectral series in absorption spectra, effect of nuclear motion on line spectra (correction of finite nuclear mass),
Week 2	variation in Rydberg constant due to finite mass, short comings of Bohr's theory, Wilson sommerfeld quantization rule, de-Broglie interpretation of Bohr quantization law, Bohr's corresponding principle, Sommerfeld's extension of Bohr's model, Sommerfeld relativistic correction, Short comings of Bohr-Sommerfeld theory,
Week 3	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.
	Month (Feb)
Week 4	**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 Non-penetrating orbits, Penetrating orbits on the classical model; Quantum defect, spin orbit interaction energy of the single valance electron, spin orbit interaction for penetrating and non-penetrating orbits. quantum mechanical relativity correction
Week 5	Hydrogen fine spectra, Main features of Alkali Spectra and their theoretical interpretation, term series and limits, Rydeburg-Ritze 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 6	**UNIT-III: Vector Atom model (two valance electrons)** Essential features of spectra of Alkaline-earth elements, Vector model for two valance electron atom: application of spectra. Coupling Schemes;LS or Russell – Saunders Coupling Scheme and JJ coupling scheme, Interaction energy in L-S coupling (sp, pd configuration), Lande interval rule, Pauli principal and periodic classification of the elements
Week 7	Interaction energy in JJ Coupling (sp, pd configuration), equivalent and non-equivalent electrons, Two valance electron system-spectral terms of non-equivalent and equivalent electrons, comparison of spectral terms in L-S And J-J coupling. Hyperfine structure of spectral lines and its origin; isotope effect, nuclear spin.
	Month (March)
Week 8	**Unit –IV: Atom in External Field** Zeeman Effect (normal and Anomalous),Experimental set-up for studying Zeeman effect, Explanation of normal Zeeman effect(classical and quantum mechanical), Explanation of anomalous Zeeman effect(Lande g-factor), Zeeman pattern of D1 and D2 lines of Naatom, Paschen-Back effect of a single valence electron system. Weak field Stark effect of

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Class: B.Sc. Physics (Pass Course 6th Semester)
Name of Subject: Atomic and Molecular Spectroscopy(Physics-PH-602)

	Hydrogen atom. Month (April)
Week 9	**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.
	Revision, Assignment and Test

Text and Reference Books:

1 Beiser A, Concept of Modern Physics (1987), Mc Graw Hill Co Ltd, New Delhi
2. Ghoshal S N, Atomic and Nuclear Physics Vol I (1996) S Chand & Co, New Delhi
3. Gopalkrishnan K, Atomic and Nuclear Physics (1982), Mc Millan India New Delhi
4. Raj Kumar, Atomic and Moleculer Spectra:Laser , Kedarnath Ram nathpub.
5. S.L.Gupta, V.Kumar,R.C.Sharma, Elements of Spectroscopy,Pragati Prakashan.

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Summary of Lesson Plan of College Faculty

Academic Session 2024-25 **Semester: Even**

Name of College: Govt. College for Women, Bastara, Karnal
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 4th Semester NEP)
Name of Subject: Waves and Optics (B23 PHY 401)

Feb 2025 to May 2025	
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, classification of fringes in films, Interference due to transmitted light and reflected light, wedge shaped film, Newton's rings
Week 4	**Unit- 2: Diffraction** Fresnel"s diffraction: Huygens-Fresnel"s theory, Fresnel's assumptions, rectilinear propagation of light, diffraction at a straight edge
Week 5	Rectangular slit and diffraction at a circular aperature. Diffraction due to a narrow slit, diffraction due to a narrow wire.
Week 6	Fraunhoffer diffraction: Single slit diffraction, double slit diffraction, plane transmission grating spectrum, **Assignment**
Week 7	dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating, rectilinear propagation of light, zone plate, diffraction at a straight edge, rectangular slit and circular aperture, diffraction due to a narrow slit and wire.
Week 8	**Unit-3: POLARIZATION** Polarization: Polarisation by reflection, refraction and scattering, Malus Law, Phenomenon of double refraction
Week 9	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
Week 10	Fresnel's theory of optical rotation, Specific rotation, Polarimeters (half shade and Biquartz)
Week 11	**Unit-4 :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);
Week 12	Metastable state, Excitation mechanism and Types of Lasers (He-Ne Laser & Ruby Laser), Applications of Lasers

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Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2024-25** **Semester: Even**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 4th Semester NEP)
Name of Subject: Waves and Optics (B23 PHY 401)

	Fibre optics: Optical fibres and their properties, Principal of light propagation through a optical fibre, Acceptance angle and numerical aperture.
Week 13	Types of optical fibles: Single mode and multimode fibres. Advantages and Disadvantages of optical fibres. Applications of optical fibres. Fibre optic sensors: Fibre Bragg Grating
Week 14	**Revision, Assignment and Test**

Text and Reference Books:

1. Principles of Optics, M. Born and E. Wolf, Pergamaman Press
2. Optics by Ajoy Ghatak, 2008, Tata McGraw Hill
3. Fundamentals of Optics. Jenkins and White, McGraw Hill Book Co. Ltd., New Delhi

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Name of College: Govt. College for Women, Bastara, Karnal

Summary of Lesson Plan of College Faculty

Academic Session 2024-25 Semester:EVEN

Name of Asstt./Ass. Prof : Dr. Hitender Kumar

Class: B.Sc. Physics (Pass Course 2nd Semester (NEP)

Name of Subject: Electricity and Magnetism and EM theory (B23-PHY-201)

Feb 2025 to May 2025	
Week 1	**Unit-1: Vector Background and Electric Field** : Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss"s divergence theorem, Stoke"s theorem.
Week 2	Conservative nature of Electrostatic Field, Electrostatic Potential, Potential as line integral of field, potential difference Derivation of electric field E from potential as gradient. Derivation of Laplace and Poisson equations. Electric flux, Gauss's Law
Week 3	Differential form of Gauss's law and applications of Gauss's law. Mechanical force of charged surface, Energy per unit volume.
Week 4	**Unit 2: Magnetic Field:** Biot-Savart law and its simple applications: straight wire and circular loop, Current Loop as a Magnetic Dipole and its Dipole Moment, Ampere's Circuital Law and its applications to (1) Solenoid and (2) Toroid, properties of B: curl and divergence
Week 5	**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), Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H and M
Week 6	Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin's theory), Cycle of Magnetization- B-H curve and hysteresis loop: Energy dissipation, Hysteresis loss and importance of Hysteresis Curve **Assignment**
Week 7	**Unit- 3: Time varying electromagnetic fields:** Electromagnetic induction,Faraday's laws of induction and Lenz's Law, Self-inductance, Mutual inductance, Energy stored in a Magnetic field, Derivation of Maxwell's equations, Displacement current, Maxwell's equations in differential and integral form and their physical significance.
Week 8	**Electromagnetic Waves:** Electromagnetic waves, Transverse nature of electromagnetic wave, energy transported by electromagnetic waves, Poynting vector, Poynting"s theorem.
Week 9	Propagation of Plane electromagnetic waves in free space & Dielectrics
Week 10	**Unit -4: DC current Circuits**: Electric current and current density, Electrical conductivity and Ohm"s law (Review), Kirchhoff"s laws for D.C. networks, Network theorems: Thevenin"s theorem, Norton theorem, Superposition theorem.

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Academic Session 2024-25 Semester:EVEN

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Class: B.Sc. Physics (Pass Course 2nd Semester (NEP)

Name of Subject: Electricity and Magnetism and EM theory (B23-PHY-201)

Week 11	Alternating Current Circuits: A resonance circuit, Phasor, Complex Reactance and Impedance, Analysis for RL, RC and LC Circuits, Series LCR Circuit: (1) Resonance, (2) Power Dissipation (3) Quality Factor and (4) Band Width, Parallel LCR Circuit.
Week12	Revision, Assignment and Test

Text and Reference Books:

1. Electricity and Magnetism (Berkley, Phys. Course 2), Edward M. Purcell, 1986 McGraw- Hill Education
2. Electricity and Magnetism: A.S. Mahajan & A.A. Rangwala (Tata- McGraw Hill), 1988.
3. Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw
4. Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 1998, Benjamin Cummings.
5. Feynman Lectures Vol.2, R.P. Feynman, R.B. Leighton, M. Sands, 2008, Pearson Education
6. Elements of Electromagnetics, M.N.O. Sadiku, 2010, Oxford University Press.
7. Electricity and Magnetism, J.H.Fewkes & J.Yarwood. Vol. I, 1991, Oxford Univ. Press.
8. Field and Wave Electromagnetics (2nd Edn.), David K. Cheng , Addison-Wesley Publishing Company..

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