Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2023-24 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 2024 to May 2024	
	Month (Feb)
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.
	Month (March)
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**
	Month (April)
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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Summary of Lesson Plan of College Faculty

Academic Session 2023-24 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)
Name of Subject: Statistical Physics **(Physics-PH-401)**

Jan 2024 to April 2024	
	Month (Jan)
Week 1	Unit –I: Statistical Physics I Microscopic and Macroscopic systems, events-mutually exclusive, dependent and independent. Probability, statistical probability, A- priori Probability and relation between them, probability theorems, some probability considerations,
Week 2	combinations possessing maximum probability, combination possessing minimum probability, Tossing of 2,3 and any number of Coins, Permutations and combinations, distributions of N (for N= 2,3,4) distinguishable and indistinguishable particles in two boxes of equal size, Micro and Macro states, Thermodynamical probability, Constraints and Accessible states,
Week 3	Statistical fluctuations, general distribution of distinguishable particles in compartments of different sizes, Condition of equilibrium between two systems in thermal contact-- β parameter, Entropy and Probability (Boltzman's relation).
	Month (Feb)
Week 4	Unit –II: Statistical Physics II Postulates of statistical physics, Phase space, Division of Phase space into cells, three kinds of statistics, basic approach in three statistics.
Week 5	M. B. statistics applied to an ideal gas in equilibrium- energy distribution law (including evaluation of σ and β) , speed distribution law & velocity distribution law
Week 6	. Expression for average speed, r.m.s. speed, average velocity, r. m. s. velocity, most probable energy & mean energy for Maxwellian distribution.
Week 7	Need for Quantum Statistics: Bose-Einstein energy distribution law, Application of B.E. statistics to Planck's radiation law B.E. gas, Degeneracy and B.E. Condensation,
	Month (March)
Week 8	Fermi Dirac energy distribution law, F.D. gas and Degeneracy, Fermi energy and Fermi temperature, Fermi Dirac energy distribution law, Fermi Dirac gas and degeneracy,
Week 9	Fermi energy and Fermi temperature, Fermi Dirac energy distribution law for electron gas in metals, Zero point energy, Zero point pressure and average speed (at 0 K) of electron gas,
Week 10	Specific heat anomaly of metals and its solution. M.B. distribution as a limiting case of B.E. and F.D. distributions, Comparison of three statistics.
Week 11	Unit-IV: Theory of Specific Heat of Solids Dulong and Petit law. Derivation of Dulong and Petit law from classical physics. Specific heat at low temperature,
	Month (April)
Week 12	Einstein theory of specific heat, Criticism of Einstein theory, Debye model of specific heat of solids, success and shortcomings of Debye theory, comparison of Einstein and Debye theories.
Week 13	**Revision, Assignment and Test**

Text and Reference Books:

1. Prakash S and Agarwal J P, Statistical Mechanics, Kedar Nath Ram Nath & co, Meerur
2. Reif F. statistical Physics, Berleley Physics Course Volume 5, Mc Graw Hill Book Co Ltd, New Delhi
3. Mc Quarrie D A. Statistical Mechanics, Viva Books Pvt Ltd, New Delhi.
4. Ashley Cmter (August 1999), Classical and Statistical Thermodynamics .

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Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2023-24** **Semester: Even**

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

Class: B.Sc. Physics (Pass Course 4th Semester)

Name of Subject: Wave and Optics II (Physics-PH-402)

Jan 2024 to April 2024	
	Month (Jan)
Week 1	**Unit-I: Polarization** Polarization: Polarisation by reflection, refraction and scattering, Malus Law, Phenomenon of double refraction, Huygen's wave theory of double refraction (Normal and oblique incidence)
Week 2	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.
Week 3	Optical activity, Fresnel's theory of optical rotation, Specific rotation, Polarimeters (half shade and Biquartz).
	Month (Feb)
Week 4	**Unit-II: Fourier analysis** Fourier theorem and Fourier series, evaluation of Fourier coefficient, importance and limitations of Fourier theorem, even and odd functions,
Week 5	Fourier series of functions f(x) between (i) 0 to 2pi, (ii) –pi to pi, (iii) 0 to pi, (iv) –L to L, complex form of Fourier series, Application of Fourier theorem for analysis of complex waves: solution of triangular and rectangular waves , half and full wave rectifier outputs,
Week 6	Parseval identity for Fourier Series, Fourier integrals.
Week 7	**Unit III: Fourier transforms** Fourier transforms and its properties, Application of Fourier transform (i) for evaluation of integrals, (ii) for solution of ordinary differential equations, (iii) to the following functions: f(x)= e- x2/2
	Month (March)
Week 8	**Geometrical Optics I** Matrix methods in paraxial optics, effects of translation and refraction, derivation of thin lens and thick lens formulae, unit plane, nodal planes, system of thin lenses.
Week 9	**Unit-IV: Geometrical Optics II** Chromatic, spherical, coma, astigmatism and distortion aberrations and their remedies.
Week 10	**Fiber Optics** Optical fiber, Critical angle of propagation, Mode of Propagation, Acceptance angle,
Week 11	Fractional refractive index change, Numerical aperture, Types of optics fiber, Normalized frequency, Pulse dispersion, Attenuation,
	Month (April)
Week 12	Applications, Fiber optic Communication,Advantages.
Week 13	**Revision, Assignment and Test**

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Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal Academic Session 2023-24 Semester: Even

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

Class: B.Sc. Physics (Pass Course 4th Semester)

Name of Subject: **Wave and Optics II** (Physics-PH-402)

Text and Reference Books:

1 Born M and Wolf E, Principles of Optics, Pergaman Press

2 Jenkins and white, Fundamentals of Optics, McGraw Hill Book Co Ltd, New

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Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 6th Semester)
Academic Session 2023-24 Semester: Even
Name of Subject: Solid State and Nano Physics (Physics-PH-601)

Jan 2024 to April 2024	
Week 1	Month (Jan) **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
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 6th Semester) Academic Session 2023-24 Semester: Even
Name of Subject: Atomic and Molecular Spectroscopy(Physics-PH-602)

Jan 2024 to April 2024	
	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
Week 2	spectra (correction of finite nuclear mass), 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
Week 3	corresponding principle, Sommerfeld's extension of Bohr's model, Sommerfeld relativistic correction, Short comings of Bohr-Sommerfeld 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
Week 4	model, transition probability and selection rules. **Month (Feb)** **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
Week 5	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 Hydrogen fine spectra, Main features of Alkali Spectra and their theoretical interpretation, term series and limits, Rydeburg-Ritze combination principle, Absorption
Week 6	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 . **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
Week 7	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 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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Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal *Academic Session 2023-24* *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)

	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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