M.D. Govt. Girls College, Dadupur Roran (Karnal)

LESSON PLAN (w.e.f. January 2024)

Name: Mr. Subash Chand (Assistant Professor) **Subject: Physics**
Class: B.Sc. III year 6th Sem (C.S.) **Paper: Solid State and Nano Physics**

Month/Week	Contents
January	**Unit – I: Crystal Structure I**
Week 1	Crystalline and glassy forms, liquid crystals, crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and Primitive Cell,
Week 2	Winger Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions.
Week3	Crystal planes and Miller indices, Interplaner spacing,
Week 4	Crystal structures of Zinc Sulphide, Sodium Chloride and Diamond.
February	**Unit II: Crystal Structure II**
Week 1	X-ray diffraction, Bragg's Law and experimental X-ray diffraction methods.
Week 2	K-space and reciprocal lattice and its physical significance,
Week 3	Reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c. **Assignment 1, Test**
Week 4	**UNIT-III: Vector Atom model (two valance electrons)** Historical introduction, Survey of superconductivity, Super conducting systems, High Tc Super conductors,
March	
Week 1	Isotopic Effect, Critical Magnetic Field, Meissner Effect, London Theory and Pippards' equation,
Week 2	Classification of Superconductors (type I and Type II), BCS Theory of Superconductivity, Flux quantization, Josephson Effect (AC and DC),
Week 3	Practical Applications of superconductivity and their limitations, power application of superconductors. **Assignment 2**
Week 4	**Vacations (Holi)**
April	**Unit IV: Introduction to Nano Physics**
Week 1	Definition, Length scale, Importance of Nano-scale and technology, History of Nan-technology,
Week 2	Benefits and challenges in molecular manufacturing. Molecular assembler concept, Understanding advanced capabilities.
Week 3	Vision and objective of Nano-technology, Nanotechnology in different field,
Week 4	Automobile, Electronics, Nano-biotechnology, Materials, Medicine. **Test**

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LESSON PLAN (w.e.f. February 2024)

Name: Mr. Subash Chand (Assistant Professor) **Subject: Physics**
Class: B.Sc. I year 2nd Sem (C.S.) **Paper: Electricity, Magnetism and EM Theory**

Month/Week	Contents
February	**Unit – I**
Week 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,
Week 2	Divergence and curl of a vector and their physical significance, Gauss‟s divergence theorem, Stoke‟s theorem. Conservative nature of Electrostatic Field, Electrostatic Potential.
Week3	Potential as line integral of field, potential difference Derivation of electric field E from potential as gradient. Derivation of Laplace and Poisson equations.
Week 4	Electric flux, Gauss‟s Law, Differential form of Gauss‟s law and applications of Gauss‟s law. Mechanical force of charged surface, Energy per unit volume.
March	**Unit –II**
Week 1	M**agnetic 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 **Assignment 1, Test**
Week 2	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 3	Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H and M, Electronic theory of dia and paramagnetism,
Week 4	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. **Mid-Term Exam**
April	**UNIT-III**
Week 1	**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
Week 2	Derivation of Maxwell‟s equations, Displacement current, Maxwell‟s equations in differential and integral form and their physical significance.
Week 3	**Electromagnetic Waves:** Electromagnetic waves, Transverse nature of electromagnetic wave, energy transported by electromagnetic waves, Poynting vector, Poynting‟s theorem. Propagation of Plane electromagnetic waves in free space & Dielectrics **Assignment 2**
Week 4	**Vacations (Holi)**
May	**Unit –IV**
Week 1	**DC current Circuits:** Electric current and current density, Electrical conductivity and Ohm‟s law (Review)
Week 2	Kirchhoff‟s laws for D.C. networks, Network theorems: Thevenin‟s theorem, Norton theorem, Superposition theorem
Week 3	**Alternating Current Circuits:** A resonance circuit, Phasor, Complex Reactance and Impedance, Analysis for RL, RC and LC Circuits,
Week 4	Series LCR Circuit: (1) Resonance, (2) Power Dissipation (3) Quality Factor and (4) Band Width, Parallel LCR Circuit. **Test**

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LESSON PLAN (w.e.f. January 2024)

Name: Mr. Subash Chand (Assistant Professor) **Subject: Physics**
Class: B.Sc. III year 6th Sem (C.S.) **Paper: Atomic and Molecular Spectroscopy**

Month/Week	Contents
January	**Unit – I: Historical background of atomic spectroscopy**
Week 1	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,
Week 2	effect of nuclear motion on line spectra (correction of finite nuclear mass), variation in Rydberg constant due to finite mass,short comings of Bohr's theory, explanation of spectral series in
Week3	Hydrogen atom, un-quantized states and continuous spectra, spectral series in absorption spectra, Sommerfeld relativistic correction, Short comings of Bohr-Sommerfeld theory,
Week 4	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.
February	**Unit –II: Vector Atom Model (single valance electron)**
Week 1	Orbital magnetic dipole moment (Bohr megnaton), behavior of magnetic dipole in External magnetic field; Larmors' precession and theorem. Penetrating and Non penetrating orbits, Penetrating orbits on the classical model**;** Quantum defect, **Assignment 1, Test**
Week 2	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,
Week 3	Main features of Alkali Spectra and their theoretical interpretation, term series and limits, Rydeburg-Ritze combination principle, Absorption spectra of Alkali atoms.
Week 4	Observed doublet fine structure in the spectra of alkali metals and its Interpretation, Intensity rules for doublets, comparison of Alkali spectra and Hydrogen spectrum.
March	**UNIT-III: Vector Atom model (two valance electrons)**
Week 1	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),
Week 2	Lande interval rule, Pauli principal and periodic classification of the elements. Interaction energy in JJ Coupling (sp, pd configuration), equivalent and non-equivalent electrons,
Week 3	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 **Assignment 2**
Week 4	**Vacations (Holi)**
April	**Unit –IV: Atom in External Field**
Week 1	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),
Week 2	Zeeman pattern of D1 and D2 lines of Na atom, Paschen-Back effect of a single valence electron system. Weak field Stark effect of Hydrogen atom.
Week 3	**Molecular Physics** General Considerations, Electronic States of Diatomic Molecules, Rotational Spectra (Far IR and Microwave Region),
Week 4	Vibrational Spectra (IR Region), Rotator Model of Diatomic Molecule, Raman Effect, Electronic Spectra.**Test**

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