Lesson Plan

Name of the Assistant /Associate Professor- Suman Lata

Class: Bsc III

Subject: Quantum And Laser Physics
Semester: Vth
Session:2023-24

Months	Topics
July & august	Unit 1: Origin quantum physics (Experimental basis) Origin quantum physics (Experimental basis) Overview, Scale of quantum physics, boundary between classical and quantum phenomena. photon, Photoelectric effect, Compton effect (theory and result). G.P. Thomson experiment, Phase velocity, group velocity and their relation. 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 1-D time dependent Schrodinger wave equation (Subject to force free particle). Time independent Schrodinger wave equation, Eigen values, eigen function. wave functions and its significance. Orthogonality and Normalization of function, concept of observer and operator. Expectation value of dynamical quantities, probability current density
September	Unit-2 : Application of Schrodinger wave equation: (1) Free Particle in one-dimensional box (solution of Schrodinger wave equation, eigen function, eigen values, quantization of energy and momentum, nodes and anti nodes, zero point energy). (2) One dimensional step potential E>Vo (Reflection and Transmission coefficient) (3) One dimensional step potential E<Vo (Reflection and Transmission coefficient) (4) One dimensional step barrier, E>Vo (Reflection and Transmission coefficient) (5)Solution of Schrodinger equation for harmonic oscillator (quantization of energy point energy, wave equation for ground state and excited states.)
October	Unit-3: Laser Physis-1 Absorption and emission of radiation, Main features of a laser; Directionality, high intensity high degree of coherence, spatial and temporal coherence, Einstien's coefficients and possibility of amplification, momentum transfer, life time of a level, kinetics of optical absorption (two and three level rate landerburg formula). population inversion; A necessary condition for light amplification, resonance cavity, laser pumping Threshold condition for laser emission, line broadening mechanism, homogeneous and inhomogeneous line broadening (natural, collision and Doppler broadening). Unit-4 : Ruby laser, He-Ne laser, semi conducter laser, Applications
November	Revision.

Suman

Lesson Plan

Name of the Assistant Professor: Ms. Suman Lata
Name of the Department: Physics
Class: B.Sc-III (Sem 5th)
year: 2023-24
Subject: Nuclear Physics

Month	Topic
July & August	Unit 1 Nuclear mass and binding energy, systematics nuclear binding energy, nuclear stability, Nuclear size, spin, parity, statistics magnetic dipole moment, quadrupole moment (shape concept), Determination of mass by Bain-Bridge, Bain-Bride and Jordan mass spectrograph, Determination of charge by Mosley law Determination of size of nuclei by Rutherford Back Scattering.
September	Unit 2 Interaction of heavy charged particles (Alpha particles), alpha disintegration and its theory Energy loss of heavy charged particle (idea of Bethe formula, no derivation), Energetics of alpha -decay, Range and straggling of alpha particles. Geiger-Nuttal law. Introduction of light charged particle (Beta-particle), Origin of continuous beta-spectrum (neutrino hypothesis) types of beta decay and energetics of beta decay, Energy loss of beta- particles (ionization), Range of electrons, absorption of beta-particles. Interaction of Gamma Ray, Nature of gamma rays, Energetics of gamma rays, passage of Gamma radiations through matter (photoelectric, compton and pair production effect) electron position anhilation. Asborption of Gamma rays (Mass attenuation coefficient) and its application.
October	Unit 3 Nuclear reactions, Elastic scattering, Inelastic scatting, Nuclear disintegration, photoneclear reaction, Radiative capture, Direct reaction, heavy ion reactions and spallation Reactions, conservation laws. Q-value and reaction threshold. Nuclear Reactors General aspects of Reactor design. Nuclear fission and fusion reactors (Principles, construction, working and use)
November	Unit 4 Linear accelerator, Tendem accelerator, Cyclotron and Betatron accelerators. Ionization chamber, proportional counter, G.M. counter detailed study, scintillation counter and semiconductor detector. Revision

Suman

Lesson Plan

Name of the Assistant /Associate Professor Suman Lata

Class: Bsc II

Subject:Physics (Waves & Optics-1)

Semester: IIIrd
Session:2023-24

Months	Topics
July & August	Unit-I: Interference I Interference by division of wave front: Young's double slit experiment, coherence, conditions of interference, Fresnel's biprism and its applications to determine wavelength of sodium light and thickness of a mica sheet, Lloyd's mirror, Difference between Bi-pirsm and Llyod mirror fringes, phase change on reflection.
September	Unit-II: Interference II Interference by division of amplitude: plane parallel thin film, production of colours in thin films, classification of fringes in films, wedge shaped film, Newton's rings. Interferometers: Michelson's interferometer and its application to (i) Standardization of a meter (ii) determination of wavelength. Unit-III: Diffraction I Fresnel's diffraction: Fresnel's assumptions and half-period zones methods
October	Rectilinear propagation of light, zone plate, diffraction at a straight edge, rectangular slit and circular aperture, diffraction due to a narrow slit and wire. Unit-III: Diffraction II Fraunhoffer diffraction: Single-slit diffraction, double slit diffraction, N-slit diffraction, plane transmission granting spectrum, dispersive power of granting, limit of resolution. Rayleigh's criterion, resolving power of telescope and a granting. Difference between prism and granting spectra.
November	Revision.

Suman
Signature of the teacher

Lesson Plan

Name of the Assistant Professor Suman Lata

Class and Section : Bsc II (3rd Sem.)

Subject: Physics(Computer programming and thermodynamics)

Semester: IIIrd
Session:2023-24

Months	Topics
July & August	Unit-1: Computer Programming Computer organization, binary representation, algorithm, flowchart, FORTRAN preliminaries, executable & non- executable, input and output statements, formats, IF, DO and GO TO statements, Dimension arrays, statement function and function subprogram.
September	Unit-2: Applications of FORTRAN programming Algorithm, flow chart and programming for print out of natural numbers, range of given numbers, ascending and descending order, mean standard deviation least square fitting of curve, roots of quadratic equation, product of matrices, numerical integration. Unit-3: Thermodynamics-I Second law, Carnot theorem, absolute scale of temperature
October	Joule Thomson effect, experiment, conclusion and explanation, T-S diagram, Nernst heat law, liquefaction of gases: oxygen, air, hydrogen, helium. Unit-4: Thermodynamics-II Clausius-Clapeyron equation and their significance, phase diagram, triple point, development of Maxwell thermo dynamical relation, Internal energy, Helmholtz function, enthalpy, Gibbs function, application of Maxwell relations.
November	Revision

Suman
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Lesson Plan

Name of the Assistant /Associate Professor Suman Lata

Class and Section: Bsc I

Subject: Physics(Classical, Mechanics and Theory of Rlativity)

Semester: Ist
Session: 2023-24

Months	Topics
August	Unit-I: Basic concepts of classical mechanics Mechanics of single and system of particals, conservation law of linear momentum and mechanical energy for a particle and system of particles. Centre of Mass and equation of motion, constrained motion.
September	Unit-II: Generalized notations Degrees of freedom and generalized coordinates, transformation equations, Generalized displacement, velocity, acceleration, momentum, force and potential. Hamilton's variational principle. Lagrange's equation of motion from Hamilton's principle. I mean Harmonic oscillator. Simple pendulum. Atwood's machine.
October	Unit-III: Theory of relativity Reference system, internal and non- internal frames, Galilean invariance laws, Newtonian Relativity Principle, Michelson- Morley experiment search for ether. Lorentz transformations. Unit-IV: Applications of theory of relativity Length Contraction, Lime dilation, Twin paradox, Velocity addition theorem. Variation of mass with velocity, Mass energy equivalence.
November	Revision.

Suman
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Lesson Plan

Name of the Assistant Professor Suman Lata

Class and Section: Bsc I (1st Sem.)

Subject: Physics(Electricity, Magnetism & Electomagnetic Theory)

Semester: Ist
Session:2023-24

Months	Topics
August	Unit-I: Vector background and electric field Gradient of a scalar, line, surface and volume integral of a vector, flux of a vector field, Divergence and curt of a vector, gauss divergence theorem, stokes theorem, derivation of electric field from potential as gradient, laplace and poisson equation, electric flux, gauss law, mechanical force, energy per unit volume.
September	Unit-II: Magnetism Magnetic induction, mag. Flux solenoidal nature of induction, properties of mag. Field, electronic theory of dia and para magnetism, domain theory of ferromagnetism, hysteresis loop, hysteresis loss, importance of hysteresis curve. Unit-III: Electromagnetism Derivation of Maxwell eqn., displacement current, vector and scalar potentials, boundary condition pointing vector and pointing theorem.
October	Unit-IV: Electromagnetic induction Electromagnetic induction, faraday law of electromagnetic induction, lenz law, self and mutual induction, self and mutual induction of long solenoid, energy stored in an inductor, growth and decay of current in a circuit with R&C, R&L, L&C, R, L&C, A.C circuit analysis with R&C, R&L, L&C, R, L&C, series and parallel resonant circuit, quality factor.
November	Revision.

Suman
Signature of the teacher

Lesson Plan

Name of the Assistant Professor: SumanLata
Name of the Department: Physics
Class and Section: B.Sc.III (Sem 6th)
Year: 2023-24
Subject: Solid State and Nano Physics

Month	Topic
January	Unit-I Crystalline and gallssy forms, liquid crystals. Crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and primitive cell, Winger Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais tattices in two and three dimensions. Unit-II crystal planes and Miller indices, Interplanner spacing, Crystal structures of Zinc sulphide, Sodium Chloride and diamond,
February	X-ray diffraction, Bragg's Law and experimental x-ray diffraction methods, K-space. Unit-II Reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c and f.c.c. Unit.III Historical introduction, super conducting systems, High temp.super conductors , Isotopic effect , critical magnetic field Meissner Effect London theory and Pippardsequation, Classification of Superconductors , BCS Theory , Flux quantization , Josephson effect, application of super conductors
March	Unit IV: History of Nanotechnology, Benfits and challenges in molecular manufacturing. Molecular assembler concept, Vision and objective of nanotecnology. in different field, Automobile, Electronics, Nano-biotechnology, Materials, Medicine.
April	Revision

Suman

Lesson Plan

Name of the Assistant Professor: SumanLata
Department: Physics
Class and Section: B.Sc.III (6thsem.)
Year: 2023-24
Subject: Atomic and Molecular Spectroscopy

Month	Topic
January	Unit-I 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) , 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 . Vect...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 . 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 selection rules .
February	Unit- II : Vector Atom Model (single 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 , 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 .
March	UNIT - III : Vector Atom model (two valance electrons) Essential features of spectra of Alkaline - earth elements , Vector model for two valance electron atom : applicati on 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 . 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 .
April	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 Na atom , Paschen - Back 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 Revision

Suman

Lesson Plan

Name of the Assistant: SumanLata
Name of the Department: Physics
Class and Section: B.Sc.II (4th Semester) Year: 2023-24
Subject: Statistical Mechanics

Month	Topic
January	Unit 1 Probability, some probability considerations, combinations possessing maximum probability, combinations possessing minimum probability, distribution of molecules in two boxs. Case with weightage (general). Phase space, microstates and macrostates, statistical fluctuations constraints and accessible States Thermodynamical probability.
February	Unit 2 Postulates of Statistical Physics. Division of Phase space into cells, Condition of equilibrium between two system in thermal contact. b-Parameter. Entropy and Probability, Boltzman's distribution law. Evaluation of A and b. Bose-Einstein statistics, Application of B.E. Statistics to Plancks's radiation law, B.E. gas.
March	Unit 3 Fermi-Dirac statistics, M.B. Law as limiting case of B.E. Degeneracy and B.E., Condensation. F.D. Gas, electron gas in metals. Zero point energy. Specific heat of metals and its solution.
April	Unit 4 Dulong and Petit Law and its Derivation, Specific heat at low temp, Einstein Theory of specific heat, Debye Theory of specific heat, Comparision of Einstein and Debye Theories. Revision

Suman

Lesson Plan

Name of the Assistant: Suman Lata
Name of the Department: Physics
Class : B.Sc.-II Semester- 4th
year: 2023-24
Subject: Optics II

Month	Topic
January	Unit 1 Fourier Theorem and Fourier series, Evaluation of Fourier coefficients, Fourier series of f(x) Between limits (i) 0 to 2π (ii) $-\pi$ to $+\pi$ Applications of Fourier Theorem analysis of complex waves: rectangular and triangular waves, Half and Full wave rectifier output.
February	Unit 2 Fourier transforms, its properties and its applications for evaluation of integrals and for solutions of ordinary differential equations. Geometrical Optics I Matrix methods in paraxial optics, effects of translation and refraction Derivation of thick and thin lens formulae, Unit and Nodal planes.
March	Unit 3 Polarization :Polarization and Double Refraction : Polarization by reflection, Polarisation by scattering, Malus law, Phenomenon of double refraction, Huygen's wave theory of double refraction (Normal and oblique incidence), Analysis of Palorised 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 rotation, Specific rotation, Polarimeters (half shade and Biquartz)
April	Unit 4 Chromatic, spherical, coma, astigmatism, distortion aberrations and their remedies. Fiber Optics Optical fiber, Critical angle of propagation, Mode of propagation, Acceptance and Fractional refractive index change, numerical aperture, Types of Optics fiber, Normal frequency, Pulse dispersion, Attenuation, Applications, Fiber optic Communication Advantages.

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Lesson Plan

Name of the Assistant: SumanLata
Name of the Department: Physics
Class and Section: B.Sc.I (2nd Sem.) Year: 2023-24
Subject: Semiconductor Devices

Month	Topic
January	Unit 1 Semiconductors Energy bands in solids, Intrinsic&Extrinsic Semiconductors, p-n junction diode, Zener diode, LED, Photo diode, Solar cell, Rectifiers
February	Unit 2 Transistors NPN&PNP Transistors
March	Unit 3 Transistors Amplifiers Transistor biasing & stabilization, D.C. load line, Amplifiers, Feedback in Amplifiers, Emitter Follower
April	Unit 4 Oscillators Oscillators, CRO Revision

Suman
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Lesson Plan

Name of the Assistant: Suman Lata
Name of the Department: Physics
Class: B.Sc. I
Semester: 2nd
Subject: Properties of matter and kinetic theory of gases
Session: 2023-24

Month	Topic
January	Unit 1 Moment of Inertia Theorem of perpendicular axis &parallel axis, M.I. of Solid sphere, Hollow sphere, spherical shell, Solid &hollow Cylinder, etc. Acc. of a body rolling down on incline plane
February	Unit 2 Elasticity Stress, Strain, Elastic constant & relations, Poisson ratio, Torsion ofcylinder& twisting couple , Bending of beam, cantilever
March	Unit 3 Kinetic Theory of gases Pressure of an ideal gas, Ideal gas equation, Degree of freedom, Law of equipartition of energy& its applications, Vanderwallequation
April	Unit 4 Kinetic Theory of gases Maxwells distribution of speeds & velocities, Mean free path, transport of energy,momentum Diffusion of gases Revision

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