# Lesson Plan
# Class B.Sc 1st sem (2022-23)

**Subject Physics** **Teacher's Name: Dr. Shruti Bhardwaj**

**PH -101 Classical Mechanics and theory of relativity**

| Month | Topic |
|---|---|
| **September** | Unit I: Moment of inertia Rotation of rigid body, Moment of inertial, Torque, angular momentum, Kinetic Energy of rotation. Theorem of perpendicular and parallel axes (with proof), Moment of inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross–section, Fly wheel, Moment of inertia of an irregular body, Acceleration of a body rolling down on an inclined plane. |
| **October** | Unit 2: Elasticity Elasticity, Stress and Strain, Hook's law, Elastic constant and their relations, Poisson's ratio, Torsion of cylinder and twisting couple, Determination of coefficient of modulus of rigidity for the material of wire by Maxwell's needle, Bending of beam (Bending moment and its magnitude), Cantilever and Centrally loaded beam, Determination of Young's modulus for the material of the beam and Elastic constants for the material of the wire by Searle's method. |
| **November** | Unit 3: Kinetic theory of gases-I Assumption of Kinetic theory of gases, pressure of an ideal gas (with derivation), Kinetic interpretation of Temperature, Ideal Gas equation, Degree of freedom, Law of equipartition of energy and its application for specific heat of gases, Real gases, Vander wall's equation, Brownian motion( Qualitative) |
| **December** | Unit 4: Kinetic theory of gases-II Maxwell's distribution of speed and velocities (derivation required), Experimental verification of Maxwell's law of speed distribution: most probable speed, average and r.m.s. speed, Mean free path, Transport of energy and momentum, Diffusion of gases and Revision. |

# Lesson Plan
# Class B.Sc 1st sem
# Session (2022-23)

## Subject- Physics
**Teacher's Name: Dr. Sandeep Kumar**

**PH-102 Electricity Magnetism and Electromagnetic Theory**

| Month | Topic |
|---|---|
| **September** | Unit I: 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. |
| **October** | Gauss's divergence theorem, Stoke's theorem. Derivation of electric field E from potential as gradient, Derivation of Laplace and Poisson equations, Electric flux, Gauss's Law, Mechanical force of charged surface, Energy per unit volume.<br>Unit 2: Magnetism Magnetic induction, Magnetic flux, Solenoidal nature of vector field of induction, properties of (i) , (ii) , Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin's theory). |
| **November** | Cycle of magnetization- hystresis loop ( Energy dissipation, Hystresis loss and importance of Hystresis Curve)<br>Unit 3: Electromagnetism Maxwell equations and their derivations, Displacement current, Vector and Scalar potentials, Boundary conditions at interface between two different media, Propagation of electromagnetic wave (Basic idea, no derivation), Poynting vector and Poynting theorem. |
| **December** | Unit 4: A. C. Analysis A.C. circuit analysis using complex variable with (a) Capacitance and Resistance (CR) (b) Resistance and Inductance (LR) (c) Capacitance and Inductance (LC) and (d) Capacitance, Inductance and Resistance (LCR), Series and parallel resonance circuit, Quality factor (sharpness of resonance). |

**Lesson Plan**
**Class B.Sc 3rd sem (2022-23)**
**Subject Physics Teacher's Name: Dr. Shruti Bhardwaj**

**PH -301 Computer Programming and Thermodynamics**

| Month | Topic |
|---|---|
| September | UNIT-1: Computer Programming<br>Computer organization, Binary representation, Algorithm development, Flow charts and<br>their interpretation. FORTRAN Preliminaries: Integer and floating point arithmetic<br>expression, built in functions, executable and non-executable statements, input and output<br>statements, Formats, IF, DO and GO TO statements, Dimension arrays, statement<br>function and function subprogram |
| October | UNIT –2: Applications of FORTRAN programming<br>Algorithm, Flow Chart and Programming for Print out of natural numbers, Range of the<br>set of given numbers, Ascending and descending order, Mean and standard deviation,<br>Least square fitting of curve, Roots of quadratic equation, Product of two matrices,<br>Numerical integration (Trapezoidal rule and Simpson 1/3 rule) . |
| November | UNIT-3: Thermodynamics-I<br>Thermodynamic system and Zeroth law of thermodynamics. First law of thermodynamics<br>and its limitations, reversible and irreversible process. Second law of thermodynamics<br>and its significance, Carnot theorem, Absolute scale of temperature, Absolute Zero and<br>magnitude of each division on work scale and perfect gas scale, Joule's free expansion, Joule Thomson effect, Joule-Thomson (Porous plug) experiment, conclusions and<br>explanation, analytical treatment of Joule Thomson effect. Entropy, calculations of<br>entropy of reversible and irreversible process , T-S diagram, entropy of a perfect gas,<br>Nernst heat law(third law of thermodynamics), Liquefaction of gases, (oxygen, air,<br>hydrogen and helium), Solidification of He below 4K, Cooling by adiabatic demagnetization. |

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| December | derivation of Maxwell thermodynamical relations from thermodynamical functions,Application of Maxwell relations: relations between two specific heats of gas, Derivation of Clausius-Clapeyron and Clausius equation,variation of intrinsic energy with volume for (i) perfect gas (ii)Vanderwall gas (iii)solids and liquids , derivation of Stefans law, adiabatic compression and expention of gas & deduction of theory of Joule Thomson effect. |

**Lesson Plan**
**Class B.Sc 3rd sem (2022-23)**
**Subject Physics Teacher's Name: Dr. Sandeep Kumar**

**PH- 302 Wave and Optics –I**

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| September | Interference by Division of wavefront, Fresnel's biprism and its applications to determine the wavelength of sodium light and thickness of a mica sheet, Lloyd's mirror, Difference between Bi-prism and Llyod mirror fringes, phase change on reflection. |
| October | Unit 2: Interference II<br>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, Interferometer: Michelson's interferometer and its applications to (i) Standardization of a meter (ii) determination of wavelength. |
| November | Unit- 3: Diffraction I<br>Fresnel's diffraction: Fresnel's assumptions and half period zones, rectilinear propagation of light, zone plate, diffraction at a straight edge, rectangular slit and circular aperture, diffraction due to a narrow slit and wire. |
| December | Unit -4: Diffraction II<br>Fraunhoffer diffraction: single-slit diffraction, double-slit diffraction, N-slit diffraction, plane transmission granting spectrum, dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating. Differences between prism and grating spectra. Including Revision and Tests |

# Lesson Plan
# Class B.Sc 5th sem
# Session (2022-23)

**Subject- Physics Teacher's Name: Dr. Sandeep Kumar PH-501: Quantum and Laser** **Physics**

| Month | Topic |
|---|---|
| **September** | Unit I: Origin quantum physics (Experimental basis) Overview, scale of quantum physics, boundary between classical and quantum phenomena, Photon, Photoelectric effect, Compton effect (theory and result), FrankHertz experiment, de-Broglie hypothesis. Davisson and Germer experiment, ·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 functions, wave functions and its significance. Orthogonality and Normalization of function, concept of observer and operator. Expectation values of dynamical quantities, probability current density |
| **October** | Unit II: Application of Schrodinger wave equation: (i) Free particle in one-dimensional box (solution of Schrodinger wave equation, eigen functions, eigen values, quantization of energy and momentum, nodes and anti nodes, zero point energy). (ii) One dimensional step potential E > Vo (Reflection and Transmission coefficient) (iii) One dimensional step potential E < Vo (penetration depth calculation). (iv) One dimensional potential barrier, E > Vo (Reflection and Transmission coefficient) (v) One-dimensional potential barrier, E < Vo (penetration or tunneling coefficient). (vi) Solution of Schrodinger equation for harmonic oscillator (quantization of energy, Zero-point energy, wave equation for ground state and excited states). |
| **November** | Unit III: Laser Physics –I Absorption and emission of radiation, Main features of a laser: Directionality, high intensity, high degree of coherence, spatial and temporal coherence, Einstein's coefficients and possibility of amplification, momentum transfer, life time of a level, kinetics of optical absorption ((two and three level rate equation, Fuchbauer 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). |
| **December** | Unit IV: Laser Physics – II He-Ne laser and RUBY laser (Principle, Construction and working), Optical properties of semiconductor, Semiconductor laser (Principle, Construction and working), Applications of lasers in the field of medicine and industry. |

# Lesson Plan
# Class B.Sc 5th sem
# Session: 2022-23

**Subject Physics** **Teacher's Name: Dr. Shruti Bhardwaj**

**PH -502 Nuclear Physics**

| Month | Topic |
|---|---|
| **September** | Unit I: Nuclear Structure and Properties of Nuclei Nuclear composition (p-e and p-n hypotheses), Nuclear properties; Nuclear size, spin, parity, statistics, magnetic dipole moment, quadruple moment (shape concept). Determination of mass by Bain-Bridge, Bain-Bridge and Jordan mass spectrograph. Determination of charge by Mosley Law. Determination of size of nuclei by Rutherford Back Scattering. mass and binding energy, systematic of nuclear binding energy, nuclear stability an ideal gas (with derivation), Kinetic interpretation of Temperature, Ideal Gas equation, Degree of freedom, Law of equipartition of energy and its application for specific heat of gases, Real gases, Vander wall's equation, Brownian motion( Qualitative) |
| **October** | Unit II: Nuclear Radiation decay Processes Alpha-disintegration and its theory. Energetics of alpha-decay, Origin of continuous beta spectrum (neutrino hypothesis), types of beta-decay and energetics of beta-decay. Nature of gamma rays, Energetics of gamma rays. Radiation interaction Interaction of heavy charged particles (Alpha particles); Energy loss of heavy charged particle (idea of Bethe formula, no derivation), Range and straggling of alpha particles. Geiger-Nuttal law. Interaction of light charged particle (Beta-particle), Energy loss of beta-particles (ionization), Range of electrons, absorption of beta-particles. Interaction of Gamma Ray; Passage of Gamma radiations through matter (Photoelectric, Compton and pair production effect) electron-positron annihilation. Absorption of Gamma rays (Mass attenuation coefficient) and its application and Revision. |
| **November** | Unit III: Nuclear Accelerators Linear accelerator, Tendem accelerator, Cyclotron and Betatron accelerators. Nuclear Radiation Detectors. Gas filled counters; Ionization chamber, proportional counter, G.M. Counter (detailed study), Scintillation counter and semiconductor detector. |
| **December** | Unit IV: Nuclear reactions. Nuclear reactions, Elastic scattering, Inelastic scattering, Nuclear disintegration,<br>Photonuclear reaction, Radiative capture, Direct reaction, Heavy ion reactions and spallation Reactions. Conservation laws, Q-value and reaction threshold. Nuclear Reactors. Nuclear Reactors, General aspects of Reactor Design. Nuclear fission and fusion reactors, (Principle, construction, working and use). |