**Govt. College Bhattu Kalan**

**Lesson Plan-2024-25**

**Department of Physics**

**B.Sc. Semester 1st, DSC/101 (A): Mechanics (NEP)**

**Subject: Physics Dr. Vijay Kumar (Assistant professor)**

|  |  |
| --- | --- |
| July, week-4 | **Fundamentals of Dynamics:** Reference frames, Inertial and non-inertial frames of references,  Conservative and non-conservative forces, fictitious forces, |
| **August, Week-2** | Concept of potential energy,  Energy diagram. Stable and unstable equilibrium, Elastic potential energy, Force as gradient of potential energy, |
| **August, Week-3** | Centre of mass (discrete and continuous), Work &Potential energy, Impulse, Centre of Mass for a system of particles, Motion of |
| **August, Week-4** | Expression for kinetic energy, Linear momentum and  angular momentum for a system of particles in terms of centre of mass values. |
| **Sept., Week-1** | **Collisions:**  Elastic and inelastic collisions between particles, Centre of Mass and Laboratory  frames. |
| **Sept., Week-2** | Rotational Dynamics: Equation of motion of a rigid body, Rotational motion of a rigid body in general and that of plane lamina, |
| **Sept., Week-3** | Angular momentum and kinetic energy of a rigid body about principal axis, Torque, Principle of conservation of angular momentum |
| **Sept., Week-4** | Calculation of moment of inertia for rectangular, Moment of Inertia (discrete and continuous), Rotation of angular momentum vector about a fixed axis |
| **Oct. week-1** | Kinetic energy of rotation, Motion involving both translation and rotation, elementary Gyroscope. cylindrical and spherical bodies, |
| **Oct. week-2** | Forces in nature (qualitative), Central forces, Law of gravitation, Gravitational potential energy, Inertial and gravitational mass, |
| **Oct. Week-3** | Michelson-Morley Experiment and its outcome, Galilean transformation (velocity, acceleration)and its inadequacy, , |
| Oct. Week-4 | Postulates of Special Theory of Relativity, Lorentz Transformations, simultaneity, Lorentz contraction  Unit Test |
| Nov. Week-1 | Time dilation, Relativistic transformation of velocity, frequency and wave number, Relativistic addition of velocities, Variation of mass with velocity, |
| Nov. Week-2 | Revision of the Chapter and Class Test |
| **Nov. Week-3** | **Revision and class Test** |

Signature of Teacher Signature of Head of the Department

**Lesson Plan Govt. College Bhattu Kalan (Fatehabad) Session 2024-25 (Odd Semester) B.Sc. Semester 3rd, PH-03(A): Optics-I and PH-03(B): Computer Programming &Thermodynamics**

**Subject: Physics Dr. Vijay Kumar (Assistant professor)**

|  |  |
| --- | --- |
| July, week-4  **August, Week-1** | **Unit-1: Interference I,**  Interference by Division of Wave front  Young’s double slit experiment  Coherence sources,  Conditions of interference  wavelength of sodium light  What is mica sheet, Fresnel's biprism  thickness of a mica sheet  Lloyd's mirror  Difference between Lloyd’s mirror and Bi-prism  Lloyd’s mirror fringes  phase change on reflection  Conceptual problems  Numerical problems  Numerical problems  Unit discussion  **Unit-1: Interference II**  Interference by Division of Amplitude  Plane parallel thin film, Interference due to reflected light  production of colours in thin films  Film production, Interference due to transmitted light  wedge shaped film  Newton's rings  Michelson's interferometer  Applications of Interferometer to Standardization of a meter  Applications of Interferometer to determination of wavelength  Conceptual problems  Numerical problems  Class Test  **Unit -3: Diffraction I-Introduction**  Fresnel’s diffraction  Fresnel’s assumptions  half period zones  Rectilinear propagation of light  Zone plate  Diffraction at a straight edge  Rectangular slit and  Diffraction due to a narrow slit and wire  circular aperture  Conceptual problems  **Unit -4: Diffraction II-Introduction**  Fraunhoffer diffraction-Introduction  Fraunhoffer diffraction by single-slit  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  Conceptual problems  Numerical problems  Class Test  **UNIT-1: Computer Programming-**Computer organization  Flow charts and their interpretation  IF, DO statement  GO TO statements  Integer expression & Dimension arrays  floating point arithmetic expression  Built in functions, executable and non-executable statements  Input and output statements, Formats  Statement function and function subprogram  Conceptual &Numerical Problems  **UNIT –2: Applications of FORTRAN programming**  Range of the set of given numbers  Ascending and descending order  Algorithm, Flow Chart and Programming for Print out of natural numbers  Mean and standard deviation  Least square fitting of curve  Roots of quadratic equation  Product of two matrices  Numerical integration (Trapezoidal rule and Simpson 1/3 rule)  Conceptual problems& discussion  **HUNIT-3: Thermodynamics-I Thermodynamic system**  Zeroth law of thermodynamics  First law of thermodynamicsand its limitations  Reversible and irreversible process.  Second law of thermodynamics and its significance  Carnot theorem , Entropy  Absolute Zero and magnitude of each division on work scale and perfect gas scale  Absolute scale of temperature, Joule Thomson effect & Joule’s free expansion  Joule-Thomson (Porous plug) experiment,  Porous plug conclusions and explanation  Analytical treatment of Joule Thomson effect  T-S diagram  Nernst heat law,  Solidification of He below 4K  calculations of entropy of reversible and irreversible process  T-S diagram  Liquefaction of gases, (O, H, He, air)  Conceptual problems  Unit discussion  Unit discussion  Unit Test  **Holiday**  **UNIT-4: Thermodynamics-II Introduction**  Derivation of Clausius-Clapeyron  Clausius latent heat equation and their significance  specific heat of saturated vapours ,phase diagram and triple point of a substance  Development of Maxwell thermodynamically relations  Internal energy (U), Helmholtz function (F) Enthalpy (H), Gibbs function (G)  and the relations between them  Clapeyron derivation of Maxwell thermo dynamical relations from  thermo dynamical functions  Relations between two specific heats of gas  Variation of intrinsic energy with volume for (i) perfect gas (ii)Vander wall gas  (iii)solids and liquids  Derivation of Stefan’s law  Adiabatic compression and expansion of gas  Deduction of theory of Joule Thomson effect  Conceptual problems  Unit discussion  Unit discussion  Unit Test  Revision |
| **August, Week-2** |
| **August, Week-3** |
|  |
|  |
|  |
|  |
|  |
| **August, Week-4** |
|  |
|  |
|  |
|  |
|  |
| **Sept., Week-1** |
|  |
| **Sept., Week-2** |
|  |
|  |
|  |
|  |
|  |
|  |
| **Sept., Week-3** |
|  |
|  |
|  |
| **Sept., Week-4** |
|  |
|  |
|  |
|  |
| **Oct. week-1** |
|  |
|  |
|  |
|  |
| **Oct. week-2** |
|  |
|  |
|  |
|  |
|  |
| **Oct. Week-3** |
|  |
| Oct. Week-4 |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
| Nov. Week-1 |
|  |
|  |
|  |
|  |
| Nov. Week-2 |
|  |
| **Nov. Week-3** |
|  |
|  |
|  |
|  |

Signature of Teacher Signature of Head of the Department

**Lesson Plan Govt. College Bhattu Kalan (Fatehabad) Session 2024-25 (Odd Semester) B.Sc. Semester 5th, PH-05(A): Quantum & Laser Physics and PH-05(B): Nuclear Physics**

**Subject: Physics Dr. Vijay Kumar (Assistant professor)**

|  |  |
| --- | --- |
| July, week-4  **August, Week-1**  **August, Week-2**  **August, Week-3**  **August, Week-4**  **sESSSSSSssssss**  **s**  **DFD**  **Sept., Week-1**  **Sept., Week-2**  **Sept., Week-3**  **Sept., Week-4**  **Oct. week-1**  **Oct. week-2**  **Oct. Week-3**  Oct. Week-4  Nov. Week-1  Nov. Week-2  **Nov. Week-3** | **Unit I: Nuclear Structure and Properties of Nuclei** |
| Nuclear composition (p-e and p-n hypotheses) |
| Nuclear size, spin, parity |
| Nuclear properties, 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 & Curve, nuclear stability |
|  |
| Unit discussion |
| Conceptual problems |
| **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) |
| Interaction of light charged particle (Beta-particle), |
| Energy loss of heavy charged particle (idea of Bethe formula, no derivation), |
| Range and straggling of alpha particles. |
|  |
| Geiger-Nuttal law |
| 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 |
| **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 |
| Conceptual problems |
|  |
| **Unit IV: Nuclear reactions** |
| Nuclear reactions |
| Elastic scattering, & Inelastic scattering |
| Nuclear disintegration |
| Photonuclear 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 |
| **Holiday** |
|  |
| Nuclear fission and fusion reactors |
| Principle, construction, working and use of Nuclear fission and fusion |
| Conceptual problems |
| Numerical Problem |
| Unit test |
| **Paper-II, 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, |
| **Holiday** |
| 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). |
| **Holiday** |
| Time-independent Schrodinger wave equation |
| eigen values, eigen functions, wave functions and its significance |
| Orthogonality and Normalization of function |
| Concept of observer and operator. |
|  |
| **Holiday** |
| Expectation values of dynamical quantities, probability current density |
| Conceptual problems |
| Unit discussion |
| **Unit II: Application of Schrodinger wave equatio**n |
| 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 |
| One dimensional step potential E > Vo (Reflection and Transmission coefficient) |
| One dimensional step potential E < Vo (penetration depth calculation). |
| One dimensional potential barrier, E > Vo (Reflection and Transmission coefficient) |
|  |
| One-dimensional potential barrier, E < Vo (penetration or tunneling coefficient). |
| Solution of Schrodinger equation for harmonic oscillator |
| Quantization of energy, Zero-point energy, wave equation for ground state and excited states |
| Unit Discussion |
| **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 |
| population inversion, A necessary condition for light amplification, |
| resonance cavity & laser pumping |
| homogeneous and inhomogeneous line broadening |
| **Holiday** |
| Threshold condition for laser emission, line broadening mechanism |
|  |
| Natural, collision and Doppler broadening |
| Conceptual problems & discussion |
| **Unit IV: Laser Physics – II** |
| He-Ne laser (Principle, Construction and working), |
| RUBY laser (Principle, Construction and working), |
| Optical properties of semiconductor |
|  |
| Semiconductor laser (Principle, Construction and working) |
| Applications of lasers in the field of medicine |
| Applications of lasers in the field of industry. |
| Unit Discussion |
| Conceptual problems & discussion |
| Unit Test |
|  |
| Laser Discussion |
| Revision |
| Revision |
| Revision |
| Revision |

Signature of Teacher Signature of Head of the Department