**ACADEMIC PLANNER & UNITIZATION OF SYLLABUS**
**ACADEMIC YEAR 2023-24.**
**DEPARTMENT : Physics NEP CLASS : I Sem**
**Paper I-Phy-DSCT1:**

| Week,Month | CLASS | Portions Planned for 1 hour | Teacher |
|---|---|---|---|
| Aug 1st week | 1 | Units and measurements: System of units (CGS and SI), measurement of length, mass and time, | KSS |
| | 2 | Laws of motion: Newton's Laws of motion. | PA |
| | 3 | Elasticity: Hooke's law, Stress-strain diagram | PA |
| | 4 | Surface tension: Definition of surface, molecular theory | KSS |
| Aug 2nd week | 1 | dimensions of physical quantities, dimensional formulae, | KSS |
| | 2 | Dynamics of single particle and system of particles, | PA |
| | 3 | elastic moduli | PA |
| | 4 | angle of contact | KSS |
| Aug 3rd week | 1 | errors, Mean deviation | KSS |
| | 2 | Centre of mass | PA |
| | 3 | Poisson's ratio, relation between elastic constants, expression for Poisson's ratio in terms of elastic constant | PA |
| | 4 | surface energy, relation between surface tension and surface energy, | KSS |
| Aug 4th week | 1 | Problems | KSS |
| | 2 | problems | PA |
| | 3 | problems | PA |
| | 4 | problems | KSS |
| Aug 5th week | 1 | Momentum and Energy: Work and energy, | KSS |
| | 2 | Dynamics of Rigid bodies: Rotational motion about an axis | PA |
| | 3 | Work done in stretching | PA |
| | 4 | pressure difference across a curved surface (with example) | KSS |
| Oct 1st week | 1 | Conservation of linear momentum, | KSS |
| | 2 | Relation between torque and angular momentum, | PA |
| | 3 | work done in twisting a wire, twisting couple on a cylinder | PA |
| | 4 | excess pressure inside a spherical liquid drop | KSS |
| Oct 2nd week | 1 | Conservation of energy with examples, | KSS |
| | 2 | Rotational energy, Moment of inertia | PA |
| | 3 | Beams (Neutral layer, neutral axis), bending of beams, expression for bending moment | PA |
| | 4 | problems | KSS |
| Oct 3rd week | 1 | Motion of rockets | KSS |
| | 2 | Laws of MI, | PA |
| | 3 | theory of single cantilever | PA |
| | 4 | Assignment discussion | KSS |
| Oct 4thweek | 1 | problems | KSS |

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| | 2 | MI of a rectangular lamina and solid cylinder, | PA |
| | 3 | problems | PA |
| | 4 | Viscosity- | ASG |
| Oct 5thweek and Nov 1st week | 1 | Special Theory of Relativity: Review of Galilean relativity. | KSS |
| | 2 | Flywheel | PA |
| | 3 | Torsional pendulum, expression for time-period of torsional oscillations | PA |
| | 4 | Streamline flow, turbulent flow, | KSS |
| Nov 2nd week | 1 | Internal test. | KSS |
| | 2 | Internal test | PA |
| | 3 | problems | PA |
| | 4 | equation of continuity, | KSS |
| Nov 3rd week | 1 | Constancy of speed of light, Postulates of the Special Theory of Relativity. Length contraction and Time dilation. | KSS |
| | 2 | Gravitation: Law of Gravitation, Motion of a particle in a central force field Satellite in a circular orbit | PA |
| | 3 | determination of rigidity modulus and moment of inertia | KCR |
| | 4 | determination of coefficient of viscosity by Poiseuille's method, | KSS |
| Nov 4th week | 1 | Relativistic addition of velocities | KSS |
| | 2 | (motion in a plane, conservation of angular momentum, constancy of areal velocity is constant). | PA |
| | 3 | Kepler's laws (statements). | PA |
| | 4 | Stoke's method | KSS |
| Nov 5th week Dec 1st week | 1 | Problems | KSS |
| | 2 | Problems | PA |
| | 3 | determination of q, η and σ by Searle's double bar with necessary theory | PA |
| | 4 | Problems | KSS |
| Dec 2nd week | 1 | Revision | KSS |
| | 2 | Revision | PA |
| | 3 | Revision | PA |
| | 4 | Revision | KSS |

**ACADEMIC PLANNER & UNITIZATION OF SYLLABUS**
**ACADEMIC YEAR 2023-24**
**DEPARTMENT : Physics NEP CLASS : III Sem**
**Paper III-Phy-DSCT 3:**
**Wave motion and optics**

| Week/Month | CLASS | Portions Planned for 1 hour | Teacher |
|---|---|---|---|
| Oct 2nd week | 1 | Waves: Plane and Spherical Waves. Longitudinal and Transverse Waves. | KSS |
| | 2 | Standing Waves: introduction | KSS |
| | 3 | Nature of light: Corpuscular theory, The Wave model, Huygens' wave theory, , Maxwell's electromagnetic waves, | PA |
| | 4 | Fraunhofer diffraction: Introduction- Fraunhofer diffraction- | PA |
| Oct 3rd week | 1 | Characteristics of wave motion, Plane Progressive (Travelling) Wave and its equation (derivation), | KSS |
| | 2 | Velocity of transverse waves along a stretched string (derivation) | KSS |
| | 3 | Dual nature of light, concept of wave packet. Group velocity and wave velocity-relation between them. | PA |
| | 4 | Theory of single slit diffraction, Two slit diffraction pattern (qualitative), | PA |
| Oct 4th week | 1 | Wave Equation – Differential form (derivation). Particle and Wave Velocities - Relation between them, | KSS |
| | 2 | Standing (Stationary) Waves in a String - Fixed and Free Ends (qualitative). | KSS |
| | 3 | Interference of light by division of wave front: Coherent source-Interference of light waves by division of wave-front, | PA |
| | 4 | Theory of diffraction Grating - oblique incidence – experimental determination of wavelength. | PA |
| Nov 1st week | 1 | Energy Transport – Expression for intensity of progressive wave, Newton's Formula for Velocity of Sound. Laplace's Correction (Derivation) | KSS |
| | 2 | Theory of Normal modes of vibration in a stretched string, | KSS |
| | 3 | Young's double slit interference- theory and experiment, | PA |
| | 4 | Resolving power – Rayleigh criterion, Expression for resolving power of grating and telescope. | PA |
| Nov 2nd week | 1 | Brief account of Ripple and Gravity Waves., Problems Superposition of Harmonic Waves: Linearity and superposition Principle. | KSS |
| | 2 | Normal Modes of vibrations in Open and Closed Pipes – Analytical treatment | KSS |
| | 3 | Fresnel Biprism- theory Problems | PA |
| | 4 | Fresnel Diffraction- Concept of Fresnel half period | PA |

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| | | zones (mention of equations), | |
| Nov 3rd week | 1 | Revision | KSS |
| | 2 | Velocity of Longitudinal Waves in gases (derivation). | KSS |
| | 3 | Fresnel Biprism- experiment (determination of wavelength) | PA |
| | 4 | Qualitative discussion on diffraction by a circular aperture and diffraction by an opaque disc, | PA |
| Nov 4th week | 1 | Superposition of two collinear oscillations having (1) equal frequencies | KSS |
| | 2 | Energy density and energy transport of a transverse wave along a stretched string. | KSS |
| | 3 | Interference of light by division of amplitude: at thin films - reflected light | PA |
| | 4 | Zone plate (mention of equation for focal length) Comparison of Zone plate with lens, | PA |
| Dec 1st week | 1 | Superposition- (2) different frequencies (Beats) – Analytical treatment. Beats | KSS |
| | 2 | Vibrations in rods – longitudinal and transverse modes (qualitative). | KSS |
| | 3 | Interference of light by division of amplitude: at thin films – transmitted light | PA |
| | 4 | Theory of diffraction at a straight edge. | PA |
| Dec 2nd week | 1 | Superposition of two perpendicular harmonic oscillations: | KSS |
| | 2 | Concept of Resonance, Theory of Helmholtz resonator. | KSS |
| | 3 | Colours of thin films; Problems | PA |
| | 4 | Polarisation: Production of polarized light, Malus' law, | PA |
| Dec 3rd week | 1 | Lissajous Figures with equal frequency- Analytical treatment. | KSS |
| | 2 | Acoustics: Absorption coefficient, Reverberation time | KSS |
| | 3 | Theory of air wedge; | PA |
| | 4 | Phenomenon of double refraction in crystals, Huygen's theory of double refraction (qualitative), | PA |
| Dec4th week | 1 | Lissajous Figures with unequal frequency- Analytical treatment. | KSS |
| | 2 | Sabine's Reverberation formula (derivation), | KSS |
| | 3 | Theory of Newton's rings (Reflection) | PA |
| | 4 | Quarter wave plate and half wave plate, | PA |
| Jan 1st week | 1 | Uses of Lissajous' figures. | KSS |
| | 2 | Factors affecting acoustics in buildings, Requisites for good acoustics. | ASG |
| | 3 | Determination of Refractive index of a liquid. | PA |
| | 4 | Optical activity, Laurent's half shade polarimeter. | PA |
| Jan 2nd week | 1 | Problems | KSS |
| | 2 | Acoustic measurements – intensity and pressure levels. | KSS |
| | 3 | Michelson Interferometer (qualitative) | PA |
| | 4 | Problems | PA |

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| Jan 3rd week | 1 | Revision | KSS |
| | 2 | Problems and revision | KSS |
| | 3 | Problems and revision | PA |
| | 4 | Revision | PA |

**ACADEMIC PLANNER & UNITIZATION OF SYLLABUS**
**ACADEMIC YEAR 2023-24**
**DEPARTMENT : Physics NEP CLASS : V Sem**
**Paper V-Phy-DSCT 5**
**Classical Mechanics and Quantum Mechanics-I**

| Week/Month | CLASS | Portions Planned for 1 hour | Teacher |
|---|---|---|---|
| Oct 2nd week | 1 | Introduction to Newtonian Mechanics: | KSS |
| | 2 | Relativity: Newtonian principle of relativity. | PA |
| | 3 | Introduction to Quantum Mechanics | PA |
| | 4 | Foundation of Quantum Mechanics | KSS |
| Oct 3rd week | 1 | Frames of references, Newton's laws of motion, | KSS |
| | 2 | Non-inertial frames and fictitious forces. Special Theory of Relativity: | PA |
| | 3 | Brief discussion on failure of classical physics to explain black body radiation | PA |
| | 4 | Probabilistic interpretation of the wave function - | KSS |
| Oct 4th week | 1 | Inertial and non-inertial frames. Mechanics of a particle, | KSS |
| | 2 | Michelson-Morley Experiment and its result. | PA |
| | 3 | , Photoelectric effect, Compton effect, stability of atoms and spectra of atoms. | PA |
| | 4 | Normalization and orthogonality of wave functions, Admissibility conditions on a wave function, | KSS |
| Nov 1st week | 1 | Conservation of linear momentum, | KSS |
| | 2 | Postulates of Special Theory of Relativity. | PA |
| | 3 | Compton scattering: Expression for Compton shift (With derivation). | PA |
| | 4 | Schrödinger equation: equation of motion of matter waves - | KSS |
| Nov 2nd week | 1 | Angular momentum and torque, conservation of angular momentum, | KSS |
| | 2 | Lorentz Transformations. | PA |
| | 3 | Matter waves: de Broglie hypothesis of matter waves, | PA |
| | 4 | Schrodinger wave equation for a free particle in one and three dimension, | KSS |
| Nov 3rd week | 1 | Work done by a force, conservative force and conservation of energy. | KSS |
| | 2 | Simultaneity and order of events. Lorentz contraction | PA |
| | 3 | Electron microscope, Wave description of particles by wave packets, | PA |
| | 4 | Time-dependent and time-independent wave equations, | KSS |
| Nov 4th week | 1 | Lagrangian formulation: Constraints, Holonomic constraints, non-holonomic constraints, | KSS |
| | 2 | Time dilation. | PA |
| | 3 | Group and Phase velocities and relation between them, | PA |

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| | 4 | Probability current density, equation of continuity and its physical significance, | KSS |
| Dec 1st week | 1 | Scleronomic and Rheonomic constraints.. | KSS |
| | 2 | Relativistic transformation of velocity, frequency and wave number. | PA |
| | 3 | Experimental evidence for matter waves: Davisson- Germer experiment, | PA |
| | 4 | Postulates of Quantum mechanics: States as normalized wavefunctions. | KSS |
| Dec 2nd week | 1 | Generalized coordinates, degrees of freedom, | KSS |
| | 2 | Relativistic addition of velocities | PA |
| | 3 | G.P Thomson's experiment and its significance. | PA |
| | 4 | Dynamical variables as linear Hermitian operators (position, momentum, angular momentum, and energy as examples). | KSS |
| Dec 3rd week | 1 | Principle of virtual work, D'Alembert's principle, | KSS |
| | 2 | Variation of mass with velocity. | PA |
| | 3 | Heisenberg uncertainty principle: Elementary proof of Heisenberg's relation between momentum and position, energy and time, angular momentum and angular position, | PA |
| | 4 | Expectation values of operators and their time evolution. Ehrenfest theorem (no derivation), | KSS |
| Dec4th week | 1 | Lagrange equations, Newton's equation of motion from Lagrange equations, | KSS |
| | 2 | Mass energy Equivalence. | PA |
| | 3 | Illustration of uncertainty principle by Gamma ray microscope thought experiment. Consequences of the uncertainty relations: | PA |
| | 4 | Particle in a one-dimensional infinite potential well (derivation), degeneracy in three dimensional case, | KSS |
| Jan 1st week | 1 | Simple pendulum, | KSS |
| | 2 | Relativistic Doppler effect. Relativistic Kinematics. | PA |
| | 3 | Diffraction of electrons at a single slit, why electron cannot exist in nucleus? | PA |
| | 4 | Particle in a finite potential well (qualitative), Transmission across a potential barrier, the tunnel effect (qualitative), | KSS |
| Jan 2nd week | 1 | Atwood's machine and linear harmonic oscillator | KSS |
| | 2 | Transformation of Energy and Momentum. | PA |
| | 3 | Two-slit experiment with photons and electrons. Linear superposition principle as a consequence. | PA |
| | 4 | scanning tunnelling microscope, One-dimensional simple harmonic oscillator (qualitative) - concept of zero - point energy | KSS |
| Jan 3rd week | 1 | Revision | KSS |
| | 2 | Revision | PA |
| | 3 | Revision | PA |
| | 4 | Revision | KSS |

**ACADEMIC PLANNER & UNITIZATION OF SYLLABUS**
**ACADEMIC YEAR 2023-24**
**DEPARTMENT : Physics NEP CLASS : V Sem**
**Paper VI-Phy-DSCT 6**
**Elements of Atomic, Molecular& Laser Physics**

| Week/Month | CLASS | Portions Planned for 1 hour | Teacher |
|---|---|---|---|
| Oct 2nd week | 1 | Basic Atomic models Thomson's atomic model; Rutherford atomic model | PA |
| | 2 | Vector atomic model and optical spectra | KSS |
| | 3 | Molecular Physics Types of molecules based on their moment of inertia; | KSS |
| | 4 | Laser Physics Ordinary light versus laser light | PA |
| Oct 3rd week | 1 | Theory of alpha particle scattering, | PA |
| | 2 | Vector atom model – spatial quantisation, | KSS |
| | 3 | Types of molecular motions and energies; | KSS |
| | 4 | Characteristics of laser light; Interaction of radiation with matter - | PA |
| Oct 4th week | 1 | Rutherford scattering formula | PA |
| | 2 | Vector atom model - Spinning electron; | KSS |
| | 3 | Born-Oppenheimer approximation; | KSS |
| | 4 | Induced absorption, spontaneous emission and stimulated emission with mention of rate equations; | PA |
| Nov 1st week | 1 | Bohr atomic model – postulates, | PA |
| | 2 | Quantum numbers associated with vector atomic model; | KSS |
| | 3 | Origin of molecular spectra; Nature of molecular spectra; | KSS |
| | 4 | Einstein's A and B coefficients – Derivation of relation between Einstein's coefficients and radiation energy density; | PA |
| Nov 2nd week | 1 | Derivation of expression for radius, | PA |
| | 2 | Coupling schemes – L-S and j-j coupling; | KSS |
| | 3 | Theory of rigid rotator – energy levels and spectrum, | KSS |
| | 4 | Continuation | PA |
| Nov 3rd week | 1 | Expression for total energy of electron; | PA |
| | 2 | Pauli's exclusion principle; | KSS |
| | 3 | Qualitative discussion on Nonrigid rotator and centrifugal distortion; | KSS |
| | 4 | Possibility of amplification of light; Population inversion; | PA |
| Nov 4th week | 1 | Origin of the spectral lines; Spectral series of hydrogen atom; | PA |
| | 2 | Magnetic dipole moment due to orbital motion of electron – derivation; | KSS |
| | 3 | Theory of vibrating molecule as a simple harmonic oscillator – | KSS |
| | 4 | Methods of pumping; Metastable states; | PA |
| Dec 1st week | 1 | Effect of nuclear motion on atomic spectra - derivation; | PA |
| | 2 | Magnetic dipole moment due to spin motion of electron; Lande g-factor and its calculation for different states; | KSS |
| | 3 | -Energy levels and spectrum; Electronic spectra of molecules – fluorescence and phosphorescence; | KSS |
| | 4 | Requisites of laser – energy source, active medium and laser cavity; | PA |

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| Dec 2nd week | 1 | Ritz combination principle; Correspondence principle; | PA |
| | 2 | Stern-Gerlach experiment – Experimental arrangement and Principle; | KSS |
| | 3 | -Eenergy levels and spectrum; Electronic spectra of molecules | KSS |
| | 4 | Difference between Three level and four level lasers with examples; | PA |
| Dec 3rd week | 1 | Critical potentials – critical potential, | PA |
| | 2 | Fine structure of spectral lines with examples; Optical spectra – spectral terms, spectral notations, selection rules, intensity rules; Larmor frequency, | KSS |
| | 3 | Raman effect – Experimental study of Raman effect, | KSS |
| | 4 | Types of lasers with examples; Construction and Working principle of Ruby Laser | PA |
| Dec4th week | 1 | Excitation potential and ionisation potential; Atomic excitation and its types, | PA |
| | 2 | Fine structure of the sodium D-line; Zeeman effect: Types, Experimental study and classical theory of normal Zeeman effect, | KSS |
| | 3 | Stoke's and antiStoke's lines, | KSS |
| | 4 | Construction and Working principle of He-Ne Laser; | PA |
| Jan 1st week | 1 | Franck-Hertz experiment; | PA |
| | 2 | Zeeman shift expression (no derivation), examples; | KSS |
| | 3 | Classical and quantum approaches,; | KSS |
| | 4 | Application of lasers (qualitative) in science & research, isotope separation, | PA |
| Jan 2nd week | 1 | Sommerfeld's atomic model | PA |
| | 2 | Stark effect: Experimental study, Types and examples. | KSS |
| | 3 | Applications of Raman effect. | KSS |
| | 4 | Applications of laser - communication, fusion, medicine, industry, war and space | PA |
| Jan 2rd week | 1 | Revision | PA |
| | 2 | Revision | KSS |
| | 3 | Revision | KSS |
| | 4 | Revision | PA |