Academic Calendar: 2021-22
(Even Semester)

Department: Physics

Semester/ Year	Syllabus Module/Unit	No of Lectures	Name of Teacher	Distribution
II PHSGCOR02T (Electricity and Magnetism)	**Vector Analysis** Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only).		PPP	January (2022)
	Electrostatics Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field. Electric potential due to an electric dipole. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.	18	PPP	January-February (2022)
	Magnetism Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials.	10	PPP	February (2022)

	Electromagnetic Induction Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.	06	PPP	March (2022)
	Linear Network Impedance of L, C, R and their combinations. Thevenin & Norton's Theorem. Maximum power transfer theorem and superposition theorem. Anderson's bridge.	05	PPP	March (2022)
	Maxwell's Equations and Electromagnetic Wave Propagation Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.	09	PPP	April (2022)
	General topic Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances (e) Checking electrical fuses and (f) circuit continuity check. Demonstration on Carey Foster's bridge, potentiometer, resistance box, inductor coil, moving coil galvanometer (in dead beat and ballistic mode) etc.	10 Hours	PPP	April-May (2022)
	List of Practicals 1. To determine an unknown Low Resistance using Carey Foster's Bridge.	5 Hours		
	2. To verify the Thevenin and Norton theorems.	5 Hours	PPP	May-June (2022)
	3. To verify the Superposition and Maximum power transfer theorems.	5 Hours		
	4. To determine self-inductance of a coil by	5		

	Anderson's bridge. 5. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width. 6. To study the response curve of a parallel LCR cir cuit and determine its (a) Anti- resonant frequency and (b) Quality factor Q. 7. To study the characteristics of a series RC Circuit. 8. To determine an unknown Low Resistance using Potentiometer. 9. To determine the resistance of a galvanometer using Thomson's method. 10. Measurement of field strength B and its variation in a solenoid (determine dB/dx)	Hours 5 Hours 5 Hours 5 Hours 5 Hours 5 Hours	PPP PPP	
IV **PHSGCOR04T - (Waves and Optics)**	**Superposition of Two Collinear Harmonic oscillations** Linearity & Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats). **Superposition of Two Perpendicular Harmonic Oscillations** Graphical and Analytical Methods. Lissajous Figures with equal an unequal frequency and their uses.	04 02	PPP PPP	January-2022 January-2022

	Waves Motion- General Transverse waves on a string. Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves, Wave intensity.	07	PPP	January-2022
	Fluids Surface Tension: Synclastic and anticlastic surface - Excess of pressure - Application to spherical and cylindrical drops and bubbles - variation of surface tension with temperature. Viscosity: Viscosity - Rate flow of liquid in a capillary tube - Poiseuille's formula - Determination of coefficient of viscosity of a liquid - Variations of viscosity of a liquid with temperature lubrication. Qualitative discussion on water waves.	06	PPP	January-2022
	Sound Simple harmonic motion - forced vibrations and resonance - Fourier's Theorem - Application to saw tooth wave and square wave - Intensity and loudness of sound - Decibels - Intensity levels - musical notes – musical scale. Acoustics of buildings: Reverberation and time of reverberation - Absorption coefficient – Sabine's formula - measurement of reverberation time. Acoustic aspects of halls and auditoria.	06	PPP	February 2022
	Wave Optics Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle.	03	PPP	February 2022
	Interference Interference: Division of amplitude and division of wavefront. Young's Double Slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: measurement of wavelength and refractive index.	10	PPP	February 2022

	Michelson's Interferometer Idea of form of fringes (no theory needed), Determination of wavelength, Wavelength difference, Refractive index, and Visibility of fringes.	03	PPP	March 2022
	Diffraction Fraunhofer diffraction- Single slit; Double Slit. Multiple slits and Diffraction grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis.	14	PPP	March 2022
	Polarization Transverse nature of light waves. Plane polarized light – production and analysis. Circular and elliptical polarization.	05	PPP	April 2022
	List of Practical 1. To determine the frequency of an electric tuning fork by Melde's experiment and verify λ 2 –T law.	5 Hours	PPP	April 2022
	2. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).	5 Hours		
	3. To determine refractive index of the Material of a prism using sodium source.	5 Hours		
	4. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.	5 Hours		
	5. To determine wavelength of sodium light using Fresnel Biprism.	5 Hours		May-2022
	6. To determine wavelength of sodium light using Newton's Rings.	5 Hours		
	7. To determine dispersive power and resolving power of a plane diffraction grating.	5 Hours		
	8. To determine the thickness of a thin paper by	5		

	measuring the width of the interference fringes produced by a wedge-shaped Film. 9. Familiarization with: Schuster`s focusing; determination of angle of prism. 10. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating. 11. To investigate the motion of coupled oscillators. 12. To determine the wavelength of sodium source using Michelson's interferometer.	Hours 5 Hours 5 Hours 5 Hours 5 Hours		June-2022
VI **PHSGDSE04T - (Nuclear and Particle Physics)**	**Preliminary Topics** Review of mass-energy equivalence, quantum tunnelling. Qualitative discussion on properties of semiconductors. **General Properties of Nuclei** Constituents of nucleus and their Intrinsic properties, quantitative facts about mass, radii, charge density (matter density), binding energy, average binding energy and its variation with mass number, main features of binding energy versus mass number curve, N/A plot, angular momentum, parity, magnetic moment, electric moments, nuclear excites states. **Nuclear Models** Liquid drop model approach, semi empirical mass formula and significance of its various terms, condition of nuclear stability, two nucleon separation energies, Fermi gas model (degenerate fermion gas, nuclear symmetry potential in Fermi gas), evidence for nuclear shell structure, nuclear magic numbers, basic assumption of shell model, concept of mean field, residual interaction, concept of nuclear force. **Radioactivity decay** (a) Alpha decay: basics of α-decay processes,	03 09 11 10	PPP PPP PPP PPP	January (2022) January (2022) January (2022) February

	theory of α- emission, Gamow factor, Geiger Nuttall law, α-decay spectroscopy. (b) beta-decay, positron emission, electron capture, neutrino hypothesis. (c) Gamma decay: Gamma rays emission & kinematics, internal conversion.			(2022)
	Nuclear Reactions Types of Reactions, Conservation Laws, kinematics of reactions, Q-value, reaction rate, reaction cross section, Concept of compound and direct reaction, resonance reaction, Coulomb scattering (Rutherford scattering)	08	PPP	February (2022)
	Interaction of Nuclear Radiation with matter Energy loss due to ionization (Bethe- Block formula), energy loss of electrons, Cerenkov radiation. Gamma ray interaction through matter, photoelectric effect, Compton scattering, pair production, neutron interactionPage 98 with matter.	08	PPP	February (2022)
	Detector for Nuclear Radiations Basic principles of ionization chamber and GM Counter. Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT). Semiconductor Detectors (Si and Ge) for charge particle and photon detection (concept of charge carrier and mobility), neutron detector	07	PPP	March-2022
	Particle Accelerators Linear accelerator, Cyclotron, Synchrotrons.	05	PPP	March (2022)
	Particle physics			

	Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws: energy and momentum, angular momentum, parity, baryon number, Lepton number, Isospin, Strangeness and charm, concept of quark model, color quantum number and gluons.	14	PPP	April (2022)