General properties of nuclei and nuclear models – nuclear size, charge and mass determination – nuclear spin – magnetic dipole moment – mass defect, binding energy and packing fraction – nuclear forces – shell model – liquid drop model – fission, fusion and nuclear reactions – induced radioactivity – artificial transmutation – application of radio isotopes – discovery, production and detection of neutrons –cyclotron, synchrotron and betatron – radiation detectors – ionisation chamber –G.M. counter – elementary particles – classification –pions, muons, k mesonshyperons – conservation laws – cosmic rays.

Unit – 6

Quantum Mechanics and Relativity

Wave nature of particles – deBroglie waves – Davison and Germer experiment – waves and particle duality – photoelectric effect – photo electric multiplier – Einstein's equation – Compton Effect – experimental verification of Compton effect – wave nature of electron – Heisenberg's uncertainty principle – position and momentum, energy and time uncertainty – Schrodinger's wave equation – probability amplitude –properties of wave function–normalization – potential barriers – tunnelling across barriers – particle in a box (one dimension only)

Relativity — postulate of Special theory of Relativity – Lorentz transformation of equations and its application – length contraction, time dilation – variation of mass with velocity – Mass energy equivalence - Physical Significance.

Unit – 7

Solid State Physics

Crystalline and amorphous solids – crystal lattice – structure of crystals – periodicity and plane in crystal – translational and rotational symmetry – crystallography – fundamental types of lattices in two and three dimensions – Bravais lattice – lattice systems, unit cell – primitive lattice vectors – packing fraction – Miller indices – crystal planes and directions – reciprocal lattice vectors – xrays – Bragg's law – crystal diffraction by x rays -x ray spectroscopy – characteristic x ray spectra – x ray absorption and fluorescence –Mosley's law – uses of x rays – Laue and Bragg equations – symmetry elements and symmetry groups – types of crystal – different types of chemical bonds – ionic, covalent, metallic – vanderWaals bond.

Unit – 8

Optics and Spectroscopy

Defect of images – spherical aberration – methods of minimizing spherical aberration – chromatic aberration –their rectification – deviation without dispersion and dispersion without deviation – eyepiece – interference – young's double slit experiment – colours of thin film – Newton's rings – air wedge – diffraction – Fresnel and Fraunhoffer types – zone plate and diffraction grating – prism – Huygens's explanation – polarisation – double refraction - Nicol prism – quarter and half wave plates – production and detection of plane, circular and elliptically polarised light – optical activity – determination of specific rotatory power usingpolarimeter– optic fiber – fiber optic sensors – fibre optic communication systems and their advantages – laser – stimulated emission – population inversion – ruby and helium-neon laser and applications – UV and IR spectroscopy and applications – Raman effect – explanation on the basis of quantum theory – experimental arrangement – applications of Raman effect.

Unit – 9

Electrical circuits and Electronics

AC circuits with R, L and C –complex impedance and phase diagram – R-L and R-C circuits – series and parallel resonant-LCR circuits – sharpness of resonance Q factor –power in A.C. circuit –choke coil.

Semiconductor – energy band theory of solids and insulators, conductors and semiconductors – intrinsic and extrinsic semiconductors – electrons and holes as charge carriers – P type and N type semi-conductors – junction diodes –characteristics curve of diode – diode applications – Light Emitting Diodes, Photodiodes – junction transistors – characteristics of transistors –rectifier, amplifier and oscillator circuits – AM and FM transmission and reception with block diagrams – Logic circuits – NOT, AND, OR, NAND, NOR and Ex-OR gates – truth tables – Boolean algebra – deMorgan's theorems – Karnaugh map simplification –opamp IC – summing, difference, integrator and differentiator circuits using opamp – astable and monostable multi vibrators – flip- flop circuits.

Unit – 10 Experimental Physics

Errors and approximations – types of errors – absolute, relative and percentage of errors – significant figures – advantages of average – leastcount of instruments – calibration techniques – curve plotting – least square refinement – dimensional analysis and uses – parallax method – Verniercalipers – screw gauge – travelling microscope – optic lever – Haier's apparatus – calorimeter – Barton's radiation correction – focal length of concave lens by contact – galvanometer – conversion of galvanometer into ammeter and voltmeter – calibration of low range ammeter and voltmeter – ballistic galvanometer –figure of merit – Ohm meter – multimeter– tangent galvanometer – magnetometer – meter bridge – potentiometer– LCR circuits – registers and counters.