COURSE – 5 Nuclear Physics and Analytical Techniques **Credits - 4**
Paper code PHY551

Block – 1 NUCLEAR DECAY PROCESSES

Unit –1 : Alpha Spectrum, Gramow's theory of α—decay

Unit –2 : Beta Spectrum, Neutrino hypothesis, Fermi theory of α-decay, Fermi-Kurie Plots, selection rules for β-decay

Unit –3 : Gamma emission-Multi-pole radiation-selection rules for γ-decay

Unit –4 : Classification of elementary particles – Fundamental Interactions – Conservation laws

Unit –5 : Interaction of charged Particles and Gamma Radiation with matter

Unit –6 : Radiation Detectors

Block – II NUCLEAR FORCES AND NUCLEAR MODELS

Unit –7 : Properties of Nucleaus-Nuclear radius, Nuclear Mass and Binding Energy, Angular Momentum, Nuclear statistics, Parity And Symmetry, Magnetic dipole moment, Electric quadrupole Moment.

Unit –8 : Nature of nuclear forces, two body problem, Bound and Spin states of two nuclear, Theory of deuteron, Tensor forces, Exchange forces, meson theory of nuclear forces

Unit –9 : Nuclear models, Liquid model, Formula for total binding Energy of the nucleus, Wezsacher's semi empirical Mass formula, Values of the empirical coefficients

Unit –10 : Shell Model-Experimental Evidence Predictions, Spin Orbit Coupling and Achievements of the Shell-model

Block – III NUCLEAR REACTIONS

Unit –11 : Types of Nuclear reactions, Conservation laws, Kinematics of Nuclear reactions, Q-value, Nuclear cross section, Compound Nucleus, Descrete energy levels of nucleus, Breit-Wigner formula

Unit –12 : Basic properties of neutrons, classification of neutrons, Slowing down of neutrons, logarithmic decrement in nergy, Moderating ratio, neutron diffusion-neutron current density, Neutron leakage current, Fermi age equation, bohr and wheeler Theory of fission, four – factor formula