

Basic Nuclear Concepts: Mass, Charge and constituents of the nucleus, Nuclear size and distribution of nucleons, Energies of nucleons in the nucleus, Angular momentum, Parity and Symmetry, Magnetic dipole moment and electric quadrupole moment. Energy levels and mirror nuclei.

Nuclear Forces: Characteristics of nuclear forces – range and strength, Simple theory of two nucleon system – deuterons, Spin states of two nucleon system, Effect of Pauli's exclusion principle, Magnetic dipole moment and electric quadrupole moment of deuteron.

Review of Mathematical Techniques: Spherical Harmonics, Phase Shift Analysis, Coupling of Angular Momenta.

Fundamental Properties of Nuclei: Interaction of Electromagnetic field with matter, Static Electromagnetic moments, Gamma Transition and Nuclear models.

Particle Radioactivity: Alpha, Beta activities, Fermi's theory of Beta Decay, Basic theory of alpha emission.

Nuclear Reaction: Basic reaction theory, Compound Nucleus and Statistical theories, Optical model, Direct reactions

#### **TEXT BOOKS/REFERENCES:**

1. R R Roy and B P Nigam, "*Nuclear Physics*", John Wiley & Sons, 1967.
2. S S M Wong, "*Introduction to Nuclear Physics*", Wiley VCH, 1998
3. L R B Elton, "*Introductory Nuclear theory*", W B Saunders Company, 1996.
4. G R Satchler, "*Introduction to Nuclear Reactions*", McMillan, 1990.
5. I E McCarthy, "*Introduction to Nuclear Theory*", John Wiley & Sons Inc., 1968
6. Irving Kaplan, "*Nuclear Physics*", Addison – Wesley Publishing Company, 1962