

PPH302: NUCLEAR PHYSICS

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Course Objectives: To impart knowledge about basic nuclear physics properties and nuclear models for understanding of related reaction dynamics.

Nuclear Size and Shape: Scattering and electromagnetic methods for determining the nuclear radius, Wave mechanical properties of nucleus and statistics, Nuclear angular momentum and Parity, Electric and magnetic moments, nuclear shapes, Nuclear excited states.

Nuclear Forces: Types of nuclear potentials, Ground and excited states of deuteron, Exchange forces and mass formula, n-p scattering at low energies, Partial wave analysis, Scattering length, Spin dependence of n-p scattering, effective range theory in n-p scattering, p-p scattering at low energy, Meson theory of nuclear forces.

Nuclear Models: Liquid drop model, coupling of angular momenta, Extreme single particle model and analysis of its predictions, Spin-orbit coupling, Magnetic moment, Electric quadrupole moment, Collective picture, Single particle states in deformed Nucleus.

Nuclear decays & Nuclear Reactions: Type of reactions, reaction cross section, conservation laws, Q-values and its significance, Coulomb excitation, compound nucleus, energy of excitation, Breit-Wigner formula, Nuclear Resonance phenomena, Direct reactions

Course Learning Outcomes (CLO):

Students will have understanding of:

1. basic properties of nucleus and nuclear models to study the nuclear structure properties.
2. various aspects of nuclear reactions will give idea how nuclear power can be generated.

Recommended Books:

1. Roy, R.R. and Nigam, B.P., *Nuclear Physics, New Age International Ltd.*, (2001).
2. Tayal, D. C., *Nuclear Physics, Himalaya Publication home*, (2007).
3. Kaplan Irving, *Nuclear Physics, Narosa Publishing House*, (2000).
4. Krane, K.S. *Nuclear Physics, Wiley India Pvt. Ltd.*, (2008).