

PPH302 NUCLEAR PHYSICS

L	T	P	Cr
3	1	0	3.5

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: Students will have achieved the ability to:

1. explain the ground state properties of the nucleus for study of the nuclear structure behavior.
2. explain the deuteron behavior at ground and excited states.
3. apply deuteron physics and the Nucleon-Nucleon scattering for explaining the nuclear forces.
4. demonstration of the shell model and collective model descriptions.
5. apply various aspects of nuclear reactions in view of compound nuclear dynamics.

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)*.

Evaluation Scheme:

Sr. No.	Evaluation Elements	Weightage (%)
1	MST	30
2	EST	45
3	Sessionals (May include assignments/quizzes)	25