PPH436 ADVANCED NUCLEAR PHYSICS

L	T	P	Cr
3	1	0	3.5

Course Objectives: To impart knowledge about nuclear deformations, properties and nuclear models for understanding of related reaction dynamics. Beside this, students will be exposed to heavy ion physics and nuclear astrophysics.

Nuclear deformations: Effect of quadrupole deformations and higher multipole deformations, Nuclear orientation effect, deformed magic shells and related nuclear aspects, Importance of Exotic nuclear systems, halo shapes and bubble effect.

Collective Model of Nucleus: Collective model Hamiltonian, nuclear wave function for even-even nuclei and odd-A nuclei, Rotation-vibrational coupling, Nilsson model, Cranking shell model.

Heavy-Ion Physics: Total Hamiltonian function, Scattering of deformed nuclei, Fusion fission dynamics, Radioactive ion beams, tightly and loosely bound interactions, Nuclear isomers, Nuclear Molecules, Nuclear Dynamics at Intermediate and high energies, Relativistic heavy ion collisions

Nuclear Astrophysics: Hot big bang cosmology,Stellar nucleosynthesis, energy production in stars, pp chain, CNO cycle.

Course learning outcomes: Students will have achieved the ability to:

1. explain nuclear deformation and related orientation effects
2. collective description of nuclear behavior.
3. to examine dynamics of heavy-ion reactions
4. basic aspects of astrophysics

Recommended Books:

1. *Pal, M.K., Theory of Nuclear Structure, East-West Press Delhi, (1983).*
2. *Preston M. A. and Bhaduri R. K., Structure of Nucleus Addison-Wesley, (2000).*
3. *Lilley J.S., Nuclear physics principles and applications John Wiley & sons Ltd., (2007).*
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