

PPH324 NUCLEAR REACTOR PHYSICS

L T P Cr
3 1 0 3.5

Course Objectives: To impart primary but wide theoretical knowledge about nuclear reactor and related topics.

Neutron moderation: Inelastic scattering, Elastic collisions, moderating ratio, slowing down Density, Resonance escape, Moderatos.

Fission Process and diffusion theory: Prompt neutrons, Fast fission, Fission energy, Thermal utilization, Fission products, Chain reaction, Multiplication factor, Leakage of neutrons, Critical size, Diffusion and slowing down theory, Homogenous and heterogeneous reactors.

Materials for Nuclear Reactors: Fuel materials, Moderator and Reflectors, Cladding materials, Coolants and control Rods.

Type of Power reactors: Boiling water reactors, Pressurized water reactors, Pressurized heavy water reactors, Light water cooled graphite moderated reactors, Gas cooled reactors, Advanced gas cooled reactors, High temperature gas cooled reactors and liquid metal cooled reactors and Fast breeder reactors, Plasma production and its diagnosis, status of fusion reactors

Fuel and waste management: Fuel management schemes, Fuel composition, Fuel cycle cost and waste management.

Course Outcomes: Students will be able to

1. study the neutron moderation process
2. apply diffusion theory for fusion-fission dynamics
3. select materials relevant for reactor design and energy production
4. categorize different nuclear reactors
5. analyze fuel and waste management

Recommended Books:

1. Glasstons, Sammuell and Sesonke, Alexander, *Nuclear reactor Engineer*, CBS Publishers & Distributors, (2004).
2. Lamarshs, J.R., *Introduction to Nuclear Reactor Theory*, Addison-Wesley Publishing Co., 1966.

Evaluation Scheme:

Sr. No.	Evaluation Elements	Weightage (%)
1	MST	30
2	EST	40
3	Sessionals (May include assignments/quizzes)	25