

DETAILED COURSE DESCRIPTION

Course Number PHYS 341

Course Title Introduction to Nuclear Physics

Target audience The course is designed for junior level nuclear engineers and physics majors; however other engineering and science majors with the correct preparation are very welcome.

Prerequisites PHYS 232 or PHYS 250, PHYS 252 with C or better

Catalog description Introductory theoretical nuclear physics with emphasis on applied aspects. Primarily for nuclear engineering.

Expected previous knowledge

Concepts	Special relativity (length contraction, time dilation), wave-particle duality, energy-mass equivalency ($E=mc^2$), photoelectric effect.
Skills	Able to solve second order ODEs and PDEs (e.g. wave equations), particle in a box problem, calculate relativistic Doppler shifts.

Course Objectives

The objectives are: 1) To cover the basics of nuclear structure, i.e. how neutrons and protons collect together to form a nucleus. 2) To give students a basic understanding of nuclear reactions and the energetics involved. There will be a focus on fission and fusion. 3) To introduce some of the current regions of research in nuclear physics. [4) To give students the opportunity of working on a small project as part of a team. ****this will depend on the instructor****]

Sample Text

“Introductory nuclear physics”, Kenneth Krane, Wiley.

Minimum Material Covered

QM – simple problems in 1, and 3 dimensions will normally need to be covered owing to the difference in preparation between students with different backgrounds, especially transfer students.

Nuclear properties i.e. radius, mass etc.

Nuclear force, QCD concepts

Nuclear models, isotopes

How to use nuclear charts and tables of isotopes

Radioactive decay

α decay, β decay, and γ decay

Nuclear Reactions

Neutron physics, neutron activation

Fission and Fusion