

Nuclear Physics: Fundamentals and Applications - Video course

COURSE OUTLINE

Nuclear Physics originated with Geiger and Marsden bombarding alpha particles on metal foils including gold, hundred years ago sometime in the year 1909.

The hundred year journey of Nuclear physics has been very exciting, both in terms of developing experimental techniques to probe at the length scale of femtometers and also developing right kind of theoretical models to understand the vigorous activities going on inside a nucleus.

On one side it interfaces with Atomic Physics and on the other side with Particle Physics. This Basics course on Nuclear physics will give an introductory but still rigorous description of both experimental and theoretical aspects of the present understanding of nuclei and their interaction.

COURSE DETAIL

Module	Lecture	Topic
Overview of the Course	1	Remembering Geiger, Marsden and Rutherford, Alpha particle scattering from metal foils
	2	Overview of Nuclear Physics
Basic Nuclear Constituents and Properties	3-4	Measurement of Nuclear Sizes
	5-6	Binding Energy, Nuclear mass, Semi empirical formula, valley of stability, Drip Lines
Nuclear Forces	7	Inside the nucleons: quark picture
	8-10	Information from Deuteron bound state
	11-12	Information from Nuclear scattering
Nuclear Structure Models	13-15	Nucleon mean potential, approximation by specific solvable potentials, single particle energy levels, magic number
	16-18	Moments, excited states and other predictions from shell model



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Physics

Pre-requisites:

Quantum Mechanics up to three dimensional problems.

Coordinators:

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		Collective model
Radioactive decay and reactions	19-24	Alpha decay, Beta decay, Gamma decay, Nuclear reactions
	25-26	Nuclear Fission, Fusion
Astronuclear Physics	27-29	Fusion in Stars, Nucleosynthesis
	30-31	Neutrinos, neutrino oscillation
Applications of Nuclear Physics	32-35	Rutherford Backscattering Spectroscopy as a tool for depth profiling
	36-37	Nuclear Fission Reactors
	38-39	NAA, PIXE, for trace element analysis
	40-41	Radioactive Dating
	42-43	Mössbauer Spectroscopy
	44	Applications in Medicine

References:

1. Introductory Nuclear Physics, by Kenneth S Krane, John Wiley and Sons.
2. Nuclear Physics: Principles and Applications, [J. S. Lilley](#), Wiley.