

Lesson Plan

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Class and Section: M.Sc. Physics 4th Sem.

Subject: Nuclear Physics

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Week	Date	Topics
1	1 st March- 7 th March	Unit I:
		Qualitative features and phenomenological potentials
		Exchange forces
		generalized Pauli principle
		The ground state of deuteron
		Range-depth relationship for square well potential
		Neutron-Proton scattering at low energies (below 10 MeV)
2	7 th March- 14 th March	Concept of scattering length and its interpretation
		Spin dependence of neutron-proton scattering
		Effective range theory of n-p scattering
		Coherent scattering of neutrons on ortho and para hydrogen
		Magnetic moment and its importance in the determination of exact ground state of deuteron
		Nuclear reactions and cross sections
3	15 th March-21 th March	Resonance: Breit-Wigner dispersion formula for $\Gamma = 0$
		Breit-Wigner dispersion formula for all values of Γ
		The compound nucleus
		Continuum theory of cross section σ_c
		σ_c , Statistical theory of nuclear reactions
		Evaporation probability and cross sections for specific reactions
		Kinematics of the stripping and pick-up reactions
		Theory of stripping and pick-up reactions
4	29 th March- 4 th April	Liquid drop model
		Outlines of Bohr and Wheeler theory of nuclear fission

		Concept of magic numbers
5	5 th April- 11 th April	The properties of magic nucleus
		Nuclear Shell Model
		Predictions of shell closure on the basis of harmonic oscillator potential
		Need of introducing spin-orbit coupling to reproduce magic numbers
6	12 th April- 18 th April	Extreme single particle model and its predictions regarding ground state spin parity
		magnetic moment and electric quadrupole moments
		Nuclear surface deformations
		General parameterization
		Types of multipole deformations
7	19 th April- 25 th April	Quadrupole deformations
		Symmetries in collective space
		Surface vibrations
		Vibrations of a classical liquid drop
		The Harmonic quadrupole oscillator
8	26 th April- 2 nd May	The collective angular momentum operator
		The collective quadrupole operator
		Quadrupole vibrational spectrum
		Rotating nuclei
		The rigid rotor
		The symmetric rotor
9	3 rd May-9 th May	The asymmetric rotor
		Revision and tests

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	10 th May - 16 th May	