

Department of Physics

SEMESTER – IV (UG/SHPHS/C-9) CORE-T-9

Elements of Modern Physics

Credit-4; Full Marks: 25

Subject Teacher: DR ABHIJIT SINHA

SYLLABUS UNITIZATION

Month	Week	Topics to be taught
March	2	One dimensional infinitely rigid box- energy eigenvalues and Eigen functions, normalization; Quantum dot as example.
March	3	Quantum mechanical scattering and tunneling in one dimension- across a step potential & rectangular potential barrier.
March	4	Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle
April	1	Nature of nuclear force, NZ graph, Liquid Drop model: semi-empirical mass formula and binding energy,
April	2	Nuclear Shell Model and magic numbers.
April	3	CLASS TEST
April	4	Radioactivity: stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, spectrum and Pauli's prediction of neutrino;
May	1	Gamma ray emission, energy-momentum conservation: electron-positron pair creation by gamma photons in the vicinity of a nucleus.
May	2	Fission and fusion- mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons
May	3	Nuclear reactor: slow neutrons interacting with Uranium 235;
May	4	Fusion and thermonuclear reactions driving stellar energy (brief qualitative discussions).
June	1	Lasers: Einstein's A and B coefficients. Metastable states
June	2	Spontaneous and Stimulated emissions. Optical Pumping and Population Inversion.
June	3	Three-Level and Four-Level Lasers. Ruby Laser and He-Ne Laser. Basic lasing.
June	4	Class Test