**Subject Code : CCSPH10**

## CC - XIII : RELATIVITY, WAVE MECHANICS AND NUCLEAR PHYSICS

### UNIT – I : Relativity

Galilean – Newtonian relativity, Galilean transformations – Michelson Morley experiment and its importance – Einstein's postulates – Lorentz transformations and its interpretation – consequence of Lorentz transformations – Length contraction, time dilation – application to meson decay – relativistic addition of velocities – Mass-Energy equivalence – Basic idea of general theory of relativity.

### UNIT – II : Duality.

Planck's hypothesis, Planck's theory & blackbody radiation – confirmation of quantum of energy – Compton effect and Photoelectric effect – de Broglie waves – wave packet, phase and group velocities – Davisson – Germer experiment - Gamma ray microscope – Uncertainty principle and its applications.

### UNIT – III : Schrodinger equation.

Time dependent and time independent Schrodinger equation – postulates, observable and operators – probability density and current density, equation of continuity – expectation values - Particle in an infinite one-dimensional square well potential - Step – barrier – tunnel effect – application to alpha decay- One dimensional harmonic oscillator – Zero point energy – angular momentum operator – commutational relation – rigid rotator and hydrogen atom (outline only).

### UNIT – IV : Nuclear Physics.

Review of basic properties of nuclei – mass, radius, binding energy, nuclear moments – isotopes – isobars – radioactivity. Cyclotron – Betatron – Linear accelerator – Geiger Muller counter – Cloud chamber – Photographic emulsions – Q value of nuclear reaction – discovery of neutron, positron – cloud chamber photographs.

### UNIT – V : Nuclear Models

Liquid Drop Model – application to fission, fission fragments, neutrons in fission process
- nuclear energy – thermonuclear reactor – atom bomb - Shell Model – magic numbers – spin orbit coupling – application to islands of isomerism and nuclear moments.
Nuclear fusion reactor – hydrogen bomb - Basic classification of subatomic particles – photons, leptons, mesons and baryons.

### Books of study:


1. Arthus Beiser, Concepts of Modern Physics: McGraw Hill Ed. V, (1999).
2. R.Resnick, Introduction to special theory of relativity, John Wiley, (1968), New York.
3. D.C.Tayal, Nuclear Physics, Himalayan Publication house, Bombay (1980).


### Books for Reference:


1. F.K.Richmyer, E.H. Kennard & J.Cooper, Introduction to modern physics Ed. VI McGraw
2. Hill (New York), 1969.
3. I.Kaplan, Nuclear Physics, Addition Wesley, (1969).
4. M.R.Wehr, J.A.Richards Jr.T.W.Adwin, Physics of the atom, Narosa publication house, New Delhi (1984).