MODERN PHYSICS [60 hours]

Course Contents:

9. **Atomic Structure: 9.1** The nuclear atom, 9.2 Rutherford scattering and its conclusions, 9.3 limitations of Rutherford model of atom, electron orbits, 9.4 atomic spectra, 9.5 the Bohr's atom, energy level diagram and spectra of hydrogen atom, 9.6 Frank-Hertz experiment and limitations of Bohr's model, 9.7 the Sommerfeld atom [8 hours]
10. **Many Electron Atom: 10.1** Electron spin, 10.2 Stern-Gerlach experiment, 10.3 Pauli's exclusion principle, 10.4 shells and subshells of electrons, 10.5 vector atom model, 10.6 LS coupling and s, p, d, f notation [5 hours]
11. **Atomic Spectra: 11.1** Fine structures of H, Na, He and Hg, 11.2 Paschen-Back effect, 11.3 Stark effect, 11.4 normal and 11.5 anomalous Zeeman effect [7 hours]
12. **Particle properties of waves: 12.1** Electromagnetic waves and its interaction with matter, 12.2 absorption, 12.3 photoelectric effect, 12.4 Compton scattering, 12.5 pair production, 12.6 photons and gravity **[**6 hours]
13. **X-ray Spectrum: 13.1** Characteristic X-ray, 13.2 X-ray diffraction and spectrometer, 13.3 fine structure of X-ray transitions, 13.4 Moseley's law and its application [4 hours]
14. **Nuclear Structure: 14.1** Proton-electron and proton-neutron hypothesis, 14.2 nuclear composition and its properties (mass, charge, density, magnetic and electric properties), 14.3 nuclear stability and binding energy, 14.4 Meson theory of nuclear forces [6 hours]
15. **Nuclear Transformations: 15.1** Radioactivity, law of radioactive disintegration, 15.2 law of successive disintegration, 15.3 half-life, mean life, natural radioactive series, 15.4 alpha, beta and gamma ray spectra, 15.5 absorption of α particles, range, 15.6 straggling and stopping power, 15.7 theory of α decay, 15.8 neutrino hypothesis of β-decay, 15.9 biological effects of ionizing radiation [7 hours]
16. **Particle Detectors and Accelerators: 16.1** Ionization chamber, 16.2 G. M. counter, 16.3 scintillation counter, 16.4 bubble chamber, 16.5 Cerenkov detectors, 16.6 semiconductor detectors, 16.7 linear accelerator, 16.8 cyclotron, 16.9 synchrocyclotron, 16.10 betatron, the 16.11 LHC project [7 hours]