APPLIED PHYSICS II - MODERN PHYSICS

Course Code: BTFPH 10201

Course Objective:

Aim of the course is to introduce the students to fundamentals of graduate level physics which forms the basis of all the applied sciences and engineering.

Course Contents:

Module I: Relativity

Inertial and Non Inertial frame, Michelson –Morley Experiment, Special theory of relativity, Relativistic space-time transformation, Transformation of velocity and mass, Mass-energy equivalence.

Module II: Wave Mechanics

de Broglie matter waves, Davisson and Germer experiment, Heisenberg uncertainty principle, Phase and Group velocity, Wave packets, Expectation values, Physical interpretation of wave functions, Ehrenfest's theorem, Operators, Time dependent and time-independent Schrodinger equation for free and bound states, square-well potential (rigid walls, potential step)

Module III: Atomic Structure

Atom models, Energy levels, Effect of magnetic and electric field- Zeeman, Paschen Bach and Stark effect.

Lasers: Einstein's Coefficients, Population inversion, types of lasers and applications

X-rays : Production and measurement, Energy level diagram, Absorption and Diffraction, Bragg's law

Module IV: Radioactivity and Nuclear Physics

Natural and Aritifical radioactivity, Laws of radioactive disintegration, Half life, Mean life, Laws of successive decay, Radioactive equilibrium, Elementary particles. Nuclear binding energy, Semi-empirical mass formula, Fission, Fusion, Reactors, Geiger Muller Counter.

Module V: Superconductivity

Zero resistance, perfect diamagnetism – Messiner effect, Superconductivity at High TC, Type I and Type II super conductors, Direct and Indirect band gap superconductors, Cooper pairs, Elements of BCS theory.

Module IV: Nanoscience & Nanotechnology

Synthesis, Characterization and application of nanomaterials – solar cells, photocatalysis, conducting glass plates.

Examination Scheme:

Components Codes	CT	HA	S/V/Q	EE
Weightage (%)	20	10	10	60

Text & References:

- Physics of the atom, Wehr and Richards
- Solid state physics, Kittel
- Nuclear Physics, Halliday
- Nuclear Physics, Y.R. Waghmare
- Elementary solid state physics, M Ali Omar
- Solid state physics, H.C. Gupta
- Solid state physics, Dekkar
- Modern Physics, Sehgal and Chopra
- Atomic and Nuclear Physics, C.L. Arora
- Fundamentals of modern Physics, R. M. Eisberg
- Lasers and nonlinear Optics, Laud
- Nanotechnology, Mark Ratner & Daniel Ratner