COURSE FILE

PHYSICS – I (3 – 1 – 0)

Module I

Interference

Superposition of waves - coherent and incoherent superposition, Intensity distribution.

Two source interference theory, Interference in thin films. Newton's Rings, Determination of wavelength of light and refractive index of liquid.

Diffraction

Diffraction: Introduction, Types of diffraction, Fraunhofer diffraction at a single slit, Plane Diffraction grating, Grating spectra, Determination of wavelength of light, Angular dispersion, Resolving power.

Polarization

Polarization: Introduction, Types of Polarization, Production of polarized light (elementary idea), Brewster's law, Malu's law, Double refraction (only statement, explanation), Construction and working of Nicol prism, Half wave plate and Quarter wave plate, Applications of polarization (Polarimeter: Construction, Principle, Working).

Module II

Electromagnetism

Vector Calculus: Gradient, Divergence, Curl, Gauss divergence theorem, Stoke's theorem, Green's theorem.

Maxwell's electromagnetic equation in differential form and in integral form, Electromagnetic wave equation, wave equation in vacuum and in conducting medium, Poynting vector, Poynting theorem, Preliminary ideas about waveguides

Quantum mechanics

Need for Quantum Physics, Wave particle duality, Davisson Germer experiment, Schroedinger wave equation (time dependent and time independent), Properties of wave function, Operators, Eigen value, Eigen function, Expectation value, Probability current, Particle in a box, finite well, step potential and tunnelling.

Module III

Lasers

Introduction, Characteristics of lasers, Einstein's coefficients & Relation between them, Lasing action, Population inversion, Different types of Lasers (Ruby Laser, He-Ne Laser), Three and Four level pumping schemes, Applications of LASER (elementary ideas).

Fiber optics

Introduction, Principle of wave propagation in Optical Fiber, Structure of Optical Fiber, Types of Optical Fibers, Acceptance angle and acceptance cone, Numerical aperture, Applications of optical fibers in communication.

Nanomaterials

Introduction, Classification, Physical characteristics and applications (fundamentals).

LESSON PLAN

LECTURE	TOPICS TO COVER	MODULE
1-5	**Interference** Superposition of waves - coherent and incoherent superposition, Intensity distribution. Two source interference theory, Interference in thin films. Newton's Rings, Determination of wavelength of light and refractive index of liquid.	I
5-10	**Diffraction** Diffraction: Introduction, Types of diffraction, Fraunhofer diffraction at a single slit, Plane Diffraction grating, Grating spectra, Determination of wavelength of light, Angular dispersion, Resolving power.	I
10-15	**Polarization** Polarization: Introduction, Types of Polarization, Production of polarized light (elementary idea), Brewster's law, Malu's law, Double refraction (only statement, explanation), Construction and working of Nicol prism, Half wave plate and Quarter wave plate, Applications of polarization (Polarimeter: Construction, Principle, Working).	I
16-18	**Electromagnetism** Vector Calculus: Gradient, Divergence, Curl, Gauss divergence theorem, Stoke's theorem, Green's theorem. Maxwell's electromagnetic equation in differential form and in integral form, Electromagnetic wave equation, wave equation in vacuum and in conducting medium, Poynting vector, Poynting theorem, Preliminary ideas about waveguides	II
19 - 27	**Quantum mechanics** Need for Quantum Physics, Wave particle duality, Davisson Germer experiment, Schroedinger wave equation (time dependent and time independent), Properties of wave function, Operators, Eigen value, Eigen function, Expectation value, Probability current, Particle in a box, finite well, step potential and tunneling.	II
28 – 31	**Lasers** Introduction, Characteristics of lasers, Einstein's coefficients & Relation between them, Lasing action, Population inversion, Different types of Lasers (Ruby Laser, He-Ne Laser), Three and Four level pumping schemes, Applications of LASER (elementary ideas).	III
32-36	**Fiber optics** Introduction, Principle of wave propagation in Optical Fiber, Structure of Optical Fiber, Types of Optical Fibers, Acceptance angle and acceptance cone, Numerical aperture, Applications of optical fibers in communication.	III
37-40	**Nanomaterials** Introduction, Classification, Physical characteristics and applications (fundamentals).	III