PHYSICS –I (F.Y.B.Tech)
Optics and Modern Physics

Course code: PH 15001

Teaching Scheme	**Examination Scheme**
Lectures : 3hrs/week	Test 1 & 2: 20 marks each
Practical : 2hrs/week	End-Sem Exam- 60

Unit 1
Polarisation
Polarised light, Types of polarization and their representation, Brewster's law, Polarization by double refraction, Law of Malus, Optical Activity, Specific rotation, Fresenel's theory of Optical Rotation, Elliptical and Circular polarization, quarter and half wave plates.

Unit 2.
Interference and Diffraction
Interference due to thin films of uniform thickness and non-uniform thickness (with derivation), Newton's rings, Applications of interference.
Fraunhoffer diffraction at a single slit; condition of maxima and minima, Plane Diffraction grating (Diffraction at multiple slits)

Unit 3.
Laser Physics
Spontaneous and stimulated emission of radiation, Thermal equilibrium, Condition for Light amplification, Population inversion, Pumping (Three level and four level pumping), Optical Resonator, Laser Beam Characteristics, Ruby laser, He-Ne Laser, Semiconductor Laser, Nd-YAG Laser, Engineering applications of Laser (Fiber optics, Laser material interaction).

Unit 4.
Wave Mechanics
Matter waves, De-Broglie's concept of matter waves, Properties of matter waves, , Heisenberg's uncertainty principle, Schrödinger's time dependent and time independent equations, Operators, Eigen values and Eigen functions, Expectation values, Physical significance of wave function.

Unit 5.
Electrons in Potential Well
Applications of Schrödinger's equation; Motion of a free particle,

Electron in an infinite deep potential well (rigid box), Electron in a finite deep potential well (non-rigid box), concept of quantum tunneling, Linear Harmonic oscillator,
Unit 6.

Nuclear Physics

Nuclear reaction, Q-value of nuclear reaction, Nuclear fission in natural Uranium,Chain reaction, Particle detectors; Geiger Muller Counter, Scintillation counter, Circular accelerators; cyclotron

References:

- Fundamentals of Optics – Francis A. Jenkins and Harvey E. White ; Mc-Graw Hill International Edition.
- A Text Book of Optics – N. Subramanyam & Brijlal; (Vikas Publishing House Pvt.Ltd)
- LASERS Theory and Applications – K. Thyagarajan, A. K. Ghatak; Macmillan India Limited.
- Concepts of Modern Physics – Arthur Beiser ; Tata McGraw – Hill Edition
- Modern Physics – Jeremy Bernstein , Paul m. Fishbane, Stephen Gasiorowics ; Pearson Education
- Quantum Mechanics – L. J. Schiff; Mc-Graw Hill International Edition.
  PHYSICS (Volume I & II) – Resnick Halliday and Krane; Willey India 5th Edition
- Nuclear Physics- S B Patel
- A text book of Engineering physics by Avadhanulu and Kshirsagar, S.Chand Publisher

Course Outcomes:

Student should be able to:

- Analyze the intensity variation of light due to Polarization, interference and diffraction
- Explain working principle of lasers
- Explain fundamentals of quantum mechanics and apply to one dimensional motion of particles
- Calculate Q-value of nuclear reactions and describe particle detectors and accelerators