Optics and Modern Physics

F.Y.B.Tech. (Semester I)

Course code: PH-19001 (OMP)

Teaching Plan

Teaching Scheme
Lectures : 3hrs/week
Practical: 2hrs/week

Examination Scheme
Test1: 20 & Test2: 20 marks
End-Sem Exam- 60

Unit. No.	Lecture	Topic to be covered
1 Interference and Diffraction [7 Hrs]	**1**	• Introduction Interference, • Interference due to thin films of uniform thickness
	2	• Interference due to thin films of non-uniform thickness • Wedge shaped thin film • conditions of minima maxima
	3	• Properties of Wedge-shaped thin film • **Numericals**
	4	• Newton's rings • Applications of Newton's ring • Anti Reflection Coating • Numericals
	5	• Fraunhoffer diffraction at a single slit • Intensity expression with Phasor diagram • condition of maxima and minima
	6	• Plane diffraction grating • condition of maxima and minima
	7	• Applications based on diffraction • Numericals
2 Polarization [7 Hrs]	**1**	• Introduction to Polarization of light • Types of Polarization and their representation
	2	• Mathematical representation • Numericals
	3	• Polarization by selective absorption: dichroism, • polaroids (H and K) • Polarization by double refraction
	4	• Nicol prism • Production and Detection of elliptical and circular polarization
	5	• Quarter wave plate (QWP) and Half wave plate (HWP) • **Numericals**
	6	• Optical Activity • Specific Rotation

		• Fresnel's theory of optical rotation,
	7	• Analysis of Polarized light • Numericals
3 **Laser Physics** **[7 Hrs]**	**1**	• Introduction to laser • Laser and ordinary light • Laser beam characteristics • Numericals
	2	• Spontaneous and stimulated emission of radiations • Thermal equilibrium • Condition for Light amplification
	3	• Requirement of light amplification • Population inversion • Pumping (Three level and four level pumping)
	4	• Optical resonator • Ruby laser
	5	• He-Ne Laser • Nd-YAG Laser
	6	• Semiconductor Laser • Numericals
	7	• Engineering applications of Laser • (Fiber optics, Laser material interaction)
4 **Wave** **Mechanics**	**1**	• Introduction to Matter waves, • De-Broglie's concept of matter waves • Properties of matter waves • Numericals
	2	• Concept of Wave packet • Group and Phase velocity • **Numericals**
	3	• Heisenberg's uncertainty principle, • Electron diffraction experiment • **Numericals**
	4	• Physical significance of wave function • **Conditions of well behaved wave function** • **Probability Density** • **Normalization of wave function** • **Numericals**
	5	• Schrödinger's time dependent and time independent equations
	6	• Operators • Eigen values and Eigen functions • **Numericals**

	7	• Expectation values • Numericals
5 **Electrons in Potential Well**	**1**	• Applications of Schrödinger's equation: Motion of a free particle
	2	• Electron in an infinite deep potential well (rigid box) -1
	3	• Electron in an infinite deep potential well (rigid box) -2
	4	• Electron in a finite deep potential well (non-rigid box)
	5	• Numericals based on infinite and finite potential well
	6	• Concept of quantum tunneling
	7	• Linear Harmonic oscillator • Numericals
6 **Ultrasonics**	**1**	• Introduction to ultrasonic waves • Properties of ultrasonic waves • Numericals
	2	• Generation of ultrasonic waves: Magnetostriction Oscillator • Numericals
	3	• Generation of ultrasonic waves: Piezoelectric Oscillator • Numericals
	4	• Ultrasound transmission modes • Ultrasound imaging and Instrumentation
	5	• Phonocardiograph
	6	• Echo ophthalmoscope
	7	• Ultrasound blood flow meter • Numericals

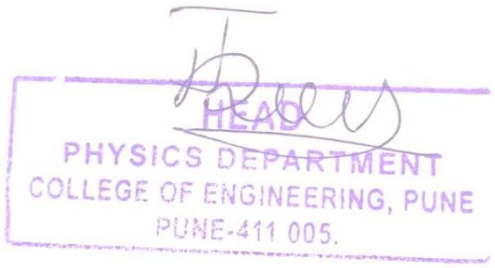
References:

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

Course Outcomes:

Student will be able to:

- Analyze the intensity variation of light due to interference, diffraction and polarization.
- They will be able to implement these phenomena to design advanced optical instruments.
- Understand the principle, construction and working of lasers in order to implement Laser Technology in engineering field.
- Understand fundamentals of quantum mechanics and apply to one dimensional motion of particles.
- Understand the principle, production and transmission of ultrasonic waves and understand the working of various instruments based on ultrasonic.



Head

Physics Department