Department of Physics

Assam Engineering College

Syllabus for B.Tech 1st Semester:
(EE, CSE, ETE, IE)

Module No	Subtitle of the Module	Topics in the Module	No. of Lectures
I	**Introduction to Electromagnetism**	Introduction to Gradient, Divergence and Curl, Laplace's and Poisson's equation for electrostatic potential. Biot-Savart law, Ampere's law, Inconsistency in Ampere's law, Continuity equation, Displacement current, Maxwell's equations with significance.	5
		Classification of magnetic materials: Diamagnetism, Paramagnetism, Ferromagnetism, Domain theory, Hysteresis loop, Hysteresis loss, Soft and Hard magnetic materials.	3
II	**Optics**	Aberration in lenses, Spherical and Chromatic Aberration, Method of minimization of Spherical and Chromatic Aberration. Interference of light by division of wave front (brief discussion) & division of amplitude, Interference due to reflected light in plane parallel film, Interference in variable thickness (wedge shaped) film, Newton's rings.	7
III	**Lasers, Fibre Optics and Holography**	Induced absorption spontaneous and stimulated emission, Einstein's coefficients, population inversion, pumping, meta-stable state, principle of LASER, characteristics of a laser beam, Gas (He-Ne) laser, Solid state (Nd:YAG) laser and semiconductor laser, Applications of lasers.	4
		Optical fibre - Principle and	5

		Structure, Propagation of light in optical fibres, Numerical aperture and angle of acceptance, Classification of optical fibres – Fiber optics materials, Single mode and Multimode optical fibres, Step Index and Graded Index optical fibres, Losses in fibres, Optical fibre communication system (Block diagram only), Introduction to Holography.	
IV	**Quantum Mechanics**	Wave nature of particles, Uncertainty principle, Wave function and wave packets, Time dependent & time independent Schrodinger equation, Solution of Schrödinger's equation for one dimensional problem: Particle in a box.	5
V	**Solid, Semiconductors and Superconductivity**	Free electron theory of metals, Density of States, Fermi level, Kronig Penny Model (Qualitative) and origin of energy bands: Metals, Semiconductors and Insulators, Solar Cell, LED, Hall effect.	5
		Properties of Superconductors; Meissner effect, Critical Magnetic Field, Isotope effect, Persistent current, Magnetic levitation, Type-1 & Type-2 superconductors and their comparison, BCS theory of superconductivity (qualitative only).	4

Text Books:

1. Applied Physics for Engineers – Neeraj Mehta (PHI Learning Pvt. Limited)
2. A text Book of Engineering Physics – Dr. M.N. Avadhanulu and Dr. P.G. Kshirsagar (S. Chand and Company Pvt. Limited)

Reference Books:

1. Introduction to Electrodynamics – D. J. Griffiths (Prentice Hall)
2. A Detailed text book of Engineering – Dr. S.P. Basavaraju (Subhas Stores, Bangalore)

List of Experiments in 1st Semester:

1. To find the Young's Modulus of Elasticity of the material of a wire by Searle's apparatus.
2. To find the value of the acceleration due to gravity by using: Bar Pendulum.

3. To determine the radius of curvature of the curved surface of the Plano convex lens or the wavelength of the source of light by Newton's Ring Method.
4. To determine the value of Mechanical Equivalent of heat, J by electrical method (using Joule's Calorimeter).
5. To find the Horizontal component of the Earth's magnetic field by using magnetometers.
6. To find the current flowing in an external circuit by using a potentiometer.
7. To find the powers of two given lenses (concave and convex), by using an optical bench.

Course Outcomes:

- **CO1:** Apply the theoretical knowledge of electromagnetism and the fundamentals of optics to solve engineering problems.

- **CO2**: Learn in detail the optical phenomena such as interference, diffraction and polarization as well as basics of LASER and fibre optics as a fundamental tool of contemporary science and technology.

- **CO3**: Learn in detail the fundamentals of quantum mechanics.

- **CO4**: Learn the basic properties of metals, semi-conductors and super conductors in order to relate with engineering applications.

Programme outcomes:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.