PHY109:ENGINEERING PHYSICS

L:3 T:1 P:0 Credits:4

Course Outcomes: Through this course students should be able to

CO1 :: apply basic physics principles in engineering courses.

CO2 :: understand fibre optics and lasers.

CO3 :: comprehend the need and importance of quantum mechanics.

Unit I

Electromagnetic theory : scalar and vectors fields, concept of gradient, divergence and curl, dielectric constant, Gauss theorem and Stokes theorem (qualitative), Poisson and Laplace equations, continuity equation, Maxwell electromagnetic equations (differential and integral forms), physical significance of Maxwell equations, Ampere Circuital Law, Maxwell displacement current and correction in Ampere Circuital Law

Unit II

Lasers and applications : fundamentals of laser- energy levels in atoms, Radiation matter interaction, Absorption of light, spontaneous emission of light, stimulated emission of light, population of energy levels, Einstein A and B coefficients, metastable state, population inversion, lasing action, properties of laser, resonant cavity, excitation mechanisms, Nd - YAG, He-Ne Laser, Semiconductor Laser, applications of laser in engineering, holography.

Unit III

Fiber optics : fiber optics introduction, optical fiber as a dielectric wave guide, total internal reflection, acceptance angle, numerical aperture, relative refractive index, V-number, step index and graded index fibers, losses associated with optical fibers, application of optical fibers

Unit IV

Quantum mechanics : need of quantum mechanics, photoelectric effect, concept of de Broglie matter waves, wavelength of matter waves in different forms, Heisenberg uncertainty principle, concept of phase velocity and group velocity (qualitative), wave function and its significance, Schrodinger time dependent and independent equation, particle in a box

Unit V

Waves : interference phenomenon, concept of resonance, production of ultrasonic waves by magnetostriction method, audible, ultrasonic and infrasonic waves, production of ultrasonic waves by piezoelectric method, ultrasonic transducers and their uses, applications of ultrasonic waves, detection of ultrasonic waves (Kundt's tube method, sensitive flame method and piezoelectric detectors), absorption and dispersion of ultrasonic waves

Unit VI

Solid state physics : free electron theory (Introduction), diffusion and drift current (qualitative)., fermi energy, fermi-dirac distribution function, band theory of solids -formation of allowed and forbidden energy bands, concept of effective mass - electrons and holes, Hall effect (with derivation), semiconductors and insulators, fermi level for intrinsic and extrinsic semiconductors, direct and indirect band gap semiconductors

Recommended Readings:

1. ENGINEERING PHYSICS by HITENDRA K MALIK, A K SINGH, MC GRAW HILL

2. ENGINEERING PHYSICS by D K BHATTACHARYA, POONAM TONDON, OXFORD UNIVERSITY PRESS

3. FUNDAMENTALS OF PHYSICS by HALLIDAY. RESNICK, WALKER, WILEY

4. ENGINEERING PHYSICS by B K PANDEY, S CHATURVEDI, CENGAGE LEARNING