101009/PH100E Physics for Computing Science

Course Contents and Lecture Schedule

No.	Topic	No. of Lectures
1	**Module 1: Oscillations (4 hours)**	
1.1	Periodic motion-simple harmonic motion- characteristics of simple harmonic motion- vibration of simple spring mass system- Resonance-definition	1
1.2	Damped harmonic oscillator – heavy, critical and light damping	1
1.3	Energy decay in a damped harmonic oscillator- quality factor	1
1.4	Forced mechanical and electrical oscillators.	1
2	**Module 2- Fundamental of Wave Optics (6 hours)**	
2.1	Theory of interference fringes-types of interference- Fresnel ‘s prism	1
2.2	Newton ‘s rings	1
2.3	Diffraction-Two kinds of diffraction-Difference between interference and diffraction-Fresnel ‘s half period zone and zone plate	1
2.4	Fraunhofer diffraction at single slit- plane diffraction grating- Temporal and Spatial Coherence	1
2.5	Polarization – Concept of production of polarized beam of light from two SHM acting at right angle	1
2.6	plane, elliptical and circularly polarized light- Brewster ‘s law- double refraction	1

3	**Module 3: Basic Idea of Electromagnetisms, Maxwell's Equations, Quantum Mechanics and Crystallography (8 hours)**	
3.1	Continuity equation for current densities	1
3.2	Maxwell's equation in vacuum and non-conducting medium	1
4.1	Introduction- Planck's quantum theory- Matter waves, de-Broglie wavelength- Heisenberg's Uncertainty principle	1
4.2	Physical significance of wave function- Time independent and time dependent Schrödinger's wave equation	1
4.3	Particle in a one-dimensional potential box- Heisenberg Picture	1
4.4	Crystallography- Basic terms-types of crystal systems- Bravais lattices- miller indices- d spacing	1
4.5	Debye Scherrer powder method, laue method- atomic packing factor for SC, BCC, FCC and HCP structures	1
4.6	Semiconductor Physics - conductor, semiconductor and Insulator; Basic concept of Band theory	1
5	**Module 4: Laser and Fiber Optics (7 hours)**	
5.1	Einstein's theory of matter radiation interaction and A and B coefficients	1
5.2	Amplification of light by population inversion	1
5.3	Different types of lasers: Ruby Laser, CO_2 and Neodymium lasers	1
5.4	Properties of laser beams: monochromaticity, coherence, directionality and brightness- laser speckle- Applications of lasers in engineering	1

5.5	Fibre optics and Applications- Types of optical fibres	1
3.6	Properties of nanomaterials & Applications of nanotechnology	2
6	**Module 5: Thermodynamics (5 hours)**	
6.1	Zeroth law of thermodynamics	1
6.2	First law of thermodynamics- brief discussion on application of 1st law	1
6.3	Second law of thermodynamics and concept of Engine- Entropy	1
6.4	Change in entropy in reversible and irreversible processes	1
6.5	Third law of thermodynamics	1