101906/PH900B ENGINEERING PHYSICS A

Course Contents and Lecture Schedule

No	Topic	No. of Lectures
1	**Module 1 (10 hours)**	
1.1	Harmonic oscillations, Damped harmonic motion-Derivation of differential equation and its solution, Over damped, Critically damped and Under damped Cases, Quality factor-Expression	2
1.2	Forced oscillations-Differential Equation-Derivation of expressions for amplitude and phase of forced oscillations, Amplitude Resonance-Expression for Resonant frequency, Quality factor and Sharpness of Resonance, Electrical analogy of mechanical oscillators	4
1.3	Wave motion- Derivation of one dimensional wave equation and its solution, Three dimensional wave equation and its solution (no derivation)	2
1.4	Distinction between transverse and longitudinal waves. Transverse vibration in a stretched string, Statement of laws of vibration	2
2	**Module 2 (10 hours)**	
2.1	Interference of light-Principle of superposition of waves, Theory of thin films - Cosine law (Reflected system), Derivation of the conditions of constructive and destructive Interference	3
2.2	Interference due to wedge shaped films -Determination of thickness and test for optical planeness, Newton's rings - Measurement of wavelength and refractive index, Antireflection coatings	4
2.3	Diffraction of light, Fresnel and Fraunhofer classes of diffraction, Diffraction grating-Grating equation	2
2.4	Rayleigh criterion for limit of resolution, Resolving and Dispersive power of a grating with expression (no derivation)	1
3	**Module 3 (10 hours)**	
3.1	Introduction for the need of Quantum mechanics, Wave nature of Particles, Uncertainty principle, Applications-Absence of electrons inside a nucleus and Natural line broadening mechanism	2
3.2	Formulation of time dependent and independent Schrodinger wave equations-Physical Meaning of wave function, Particle in a one	4

	dimensional box- Derivation for normalised wave function and energy eigen values, Quantum Mechanical Tunnelling (Qualitative)	
3.3	Introduction to nanoscience and technology, Increase in surface to volume ratio for nanomaterials, Quantum confinement in one dimension, two dimension and three dimension-Nano sheets, Nano wires and Quantum dots	2
3.4	Properties of nanomaterials-mechanical, electrical and optical, Applications of nanotechnology (qualitative ideas)	2
4	**Module 4 (10 hours)**	
4.1	Gauss's law for Magnetic flux density, Ampere's Circuital law, Faraday's law in terms of EMF produced by changing magnetic flux, Classification of magnetic materials- para, dia and ferromagnetic materials	2
4.2	Magnetic devices-Gauss divergence theorem & Stokes' theorem- Equation of continuity	1
4.3	Derivation of Maxwell's equations in vacuum- Electromagnetic waves-Velocity of Electromagnetic waves in free space	3
4.4	Band theory of solids, Semiconductors- Fermi Dirac distribution, Fermi level and Fermi energy- Bloch theorem, phonons, dispersion relations and phonon modes (Qualitative). Solid state nano devices.	4
5	**Module 5 (10 hours)**	
5.1	Super conducting Phenomena- Meissner effect and perfect diamagnetism- Types of superconductors- Type I and Type II	2
5.2	BCS Theory (Qualitative), High temperature superconductors, Applications of super conductivity	2
5.3	Introduction to photonics-Photonic devices-Light Emitting Diode, Photo detectors -Junction and PIN photodiodes, Solar cells-I-V Characteristics.	2
5.4	Optic fibre-Principle of propagation of light, Types of fibres -Step index and Graded index fibres, Numerical aperture –Derivation, Fibre optic communication system (block diagram), Industrial, Medical and Technological applications of optical fibre, Fibre optic sensors-Intensity Modulated and Phase modulated sensors	4