Oscillation

Physics - 1 Code: PH101 Contacts: 3L + 1T = 4 **Credits: 4**

Module-I

1.1 Simple Harmonic motion : Preliminary concepts, Superposition of SHMs in two mutually perpendicular directions - Lissajous figure [2L]

1.2 Damped vibration: Differential equation and its solution, Logarithmic decrement, Quality factor [3L]

1.3 Forced vibration: Differential equation and its solution, Amplitude and velocity resonance, Sharpness of resonance, Application in L-C-R circuit. [3L]

Module-2

Optics 1

2.1 Interference of electromagnetic waves: conditions for sustained interference, double sit as an example. Qualitative idea of Spatial and Temporal coherence, conservation of energy and intensity distribution, Newtown's ring. [3L]

2.2 Diffraction of light: Fresnel and Fraunhofer class, Fraunhofer diffraction for single slit and double slits. Intensity distribution of N-slits and plane transmission grating (No deduction of teh intensity distribution for N-slits is necessary). Missing orders, Rayleigh criterion, Resolving power of grating and microscope. (Definition and formulae) [5L]

Module-3

Optics 2

3.1 Polarization / General concepts of polarization, Plane of vibrationa nd plane of polarization, Qualitative discussion on plane, Circularly and Elliptically polarized light, Polarization through reflection and Brewster's law, Double reflection (birefringence) - ordinary and extra-ordinary rays, Nicol's Prism, Polaroid. Halfwave plane and quarter wave plane. [4L]
3.2 Laser: Spontaneous and stimulated emission of radiation. Population inversion. Einstein's A & B co-efficient (derivation of the mutual relation). Optical resonator and condition necessary for active laser action. Ruby laser, He-Ne Laser - application of laser. [4L]
3.3 Holography: Theory of hologaphy, viewing the hologram, Applications. [3L]

Module-4

Quantum Physics

4.1 Concepts of dependence of mass with velocity, mass energy equivalence, energymomentum relation (no deduction required). Blackbody radiation: Rayleigh Jeans' law (derivation without the calculation of number of states), Ultraviolet catastrophe, Wein's law, Planck's radiation law (calculation of the average energy of the oscillator). Derivation of Wein's displacement law and Stephen's law from Planck's radiation law. Rayleigh Jeans' law and Wein's law as limiting cases of Planck's law. Compton effect (calculation of Compton wavelenght is required). [5L]

4.2 Wave-particle duality and deBroglie's hypothesis. concepts of matter waves, Davison-Garmer experiment, concept of wave packets and Heisenberg's uncertainty principle. [4L]

Module-5

Crystallography

5.1 Elementry ideas of crystal structure: lattice, basis, unit cell, Fundamental types of lattices -Bravis lattice, Simple cubic, f.c.c. and b.c.c. lattices. (use of models in the class during teaching is desirable), Miller indices and Miller planes, Co-ordination number and Atomic packing factor. [4L]

5.2 X-rays: Origin of characteristics and continuous X-ray, Bragg's law (no derivation), Determination of lattice constant. [2L]