Syllabus

Subject: Physics **L-T-P-C: 3-1-0-4**
Code: PH 101

Waves and Oscillation:
Overview of vibrations with emphasis on damped and forced oscillations, resonance, coupled oscillations and normal modes.

Electromagnetic Waves:
Basic ideas on Gradient of scalar field, divergence of a vector field, curl of a vector field. Maxwell's equations, displacement current, electromagnetic (EM) waves, Pointing's theorem. Plane EM wave in free space, dielectric media & in conducting media. Reflection and transmission at normal and oblique incidence.

Quantum Mechanics:
Failure of Classical physics, qualitative review of relevant experiments such as blackbody radiation, photo-electric effect. de Broglie matter waves and Davison-Germer experiment, Particle vs wave: classical scenario & quantum scenario – double slit experiment uncertainty principle, wave packet and group velocity and phase velocity. Development of Schrödinger equation (time dependent & time independent), physical meaning of wave function, probability interpretation, particle on a 1D infinite potential well, potential barrier and quantum tunnelling.

Solid state Physics:
Drude's model, free electron theory and band theory of solids. Classification of materials based on band theory of solid (qualitative description) semiconductor (Intrinsic& Extrinsic), Fermi level, Density of states, electron & hole concentration at thermal equilibrium. Hall effect and magnetoresistance.

Course Outcome:

CO1:- Learners will be able to relate different kind of oscillations to standard differential equations. They will be able to explain various natural vibration phenomena.

CO2:- To apply the concept of vector operators like gradient, curl and divergence. Analyse Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.

CO3:- Examine the phenomena of wave propagation in different media and its interfaces.

CO4:- They will be able to solve model problems like particle in a box and tunnelling through potential barrier. They can apply these models to physical situations like free electron theory, scanning tunnelling microscope (STM).

CO5:- Apply the free electron theory to solids to describe electronic behaviour. Understand the origin of energy bands, and how they influence electronic behaviour. Learners will be enabled to differentiate semiconductors, conductors and insulators. They can be on a platform to appreciate device physics.

References:

1. Quantum Physics, Resnick and Eisberg
2. Vibration and waves, A. P. French
3. Introduction to Electrodynamics, D. J. Griffiths
4. Quantum Mechanics, D. J. Griffiths
5. Solid State Physics, A J Dekker
6. The Physics of Solid, R Turton