LECTURE PLAN

Course Name: PHYSICS-2 **Course Code: 15B11PH211**

A. Electromagnetism & Optical Fiber (17 lectures)

L1. Introduction of electromagnetism, Basic idea of Cartesian, Spherical polar and cylindrical coordinate systems
L2. Basics of fields, Gradient, Divergence and Curl
L3. Coulomb's law, Electric Flux & Gauss's law
L4. Applications of Gauss law for Spherical and Cylindrical symmetries (all important cases)
L5. Electric field due to charged conductor, Force per unit area on the surface of the charged conductor
L6. Laplace and Poisson's equations and their applications to solve electrostatic problems in Cartesian and cylindrical systems
L7. Treatment of electrostatic problems using Laplace and Poisson's equations in spherical coordinate system
L8. Maxwell's correction to Ampere's law, Displacement current, Maxwell's equations in free space and dielectric media (both differential and integral forms)
L9. Poynting's theorem (derivation) and Poynting vector
L10. Electromagnetic waves in free space (equations and solutions) and Transverse nature of EM waves
L11. Energy and momentum in EM waves, Radiation pressure
L12. Propagation of EM waves through boundary, Boundary Conditions across the medium,
L13. Reflection and Transmission at normal incidence
L14. Reflection and Transmission at oblique incidence- Laws of Reflection and Refraction
L15. Oblique incidence-*p* polarization, Fresnel's equations, Brewster's Law
L16. Concept of optical fiber and Principle of Total Internal Reflection in optical fiber
L17. Numerical aperture and Single, multistep & graded index fiber
L18. Attenuation coefficient, Transmission losses in optical fiber

B. Statistical Distributions and Lasers (09 lectures)

L19. Introduction to Statistical Distributions, Maxwell-Boltzmann Statistics (Classical distribution)
L20. Applications of MB distribution (Distribution of molecular energies in an ideal gas)
L21. Distribution of molecular speeds in an ideal gas
L22. Quantum distributions: Bose-Einstein and Fermi-Dirac, Applications of Bose-Einstein distributions
L23. Applications of FD distributions (electron gas, average energy)
L24. Introduction to Laser, spontaneous and stimulated emission, population inversion
L25. Einstein A and B coefficients, Principles and working of lasers
L26. Ruby laser, Applications of lasers

C. Solid State Physics (14 lectures)

L27. Basic ideas of Bonding, Ionic bonding, covalent bonding and Metallic Bonding
L28. Inter-atomic coulomb forces in ionic crystals and Determination of equilibrium separation
L29. Minimum Potential energy and determination of Madelung constant 'α 'for NaCl crystal in 1D
L30. Lattice points and space lattice, Basis and crystal structure, Unit cell and Primitive cell, Seven crystal systems and Fourteen Bravais space lattice
L31. Coordination number, nearest neighbour distance, atomic radius and packing factor in crystal structure
L32. Calculation of lattice constant, Lattice planes and Miller indices
L33: Separation between lattice planes, Derivation and examples, X-ray diffraction, Bragg's law of X- ray diffraction.
L34. Electronic conduction in metals, Quantum theory of electronic conduction in metals
L35. Distinction between metals, Semiconductors and insulators, intrinsic and extrinsic semiconductors
L36. Carrier concentration in thermal equilibrium in intrinsic semiconductor
L37. Fermi level and energy band diagram in intrinsic semiconductor, Energy band diagram and Fermi level in extrinsic semiconductors, Effect of temperature on extrinsic semiconductor
L38. Electrical conductivity of intrinsic semiconductor and extrinsic semiconductor
L39. *p-n* junction
L40. Hall Effect, allied parameters and it's applications