Syllabus

UNIT 1:
Module 1: Wave nature of particles and the Schrodinger equation (8 lectures) Introduction to Quantum mechanics, Wave nature of Particles, operators ,Time-dependent and timeindependent Schrodinger equation for wavefunction, Application: Particle in a One dimensional Box, Born interpretation, Free-particle wavefunction and wave-packets, vg and vp relation Uncertainty principle.

UNIT 2:
Module 2: Wave optics (8 lectures) Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, MachZehnder interferometer. Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

UNIT 3:
Module 3: Introduction to solids (8 lectures) Free electron theory of metals, Fermi level of Intrinsic and extrinsic, density of states, Bloch's theorem for particles in a periodic potential, Kronig-Penney model(no derivation) and origin of energy bands. V-I characteristics of PN junction, Zener diode, Solar Cell, Hall Effec .

UNIT 4:
Module 4: Lasers (8 lectures) Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO_2), solid-state lasers(ruby, Neodymium),Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine. Introduction to Optical fiber, acceptance angle and cone, Numerical aperture, V number, attenuation.

UNIT 5:
Module 5: Electrostatics in vacuum (8 lectures) Calculation of electric field and electrostatic potential for a charge distribution; Electric displacement, Basic Introduction to Dielectrics, Gradient, Divergence and curl,Stokes' theorem, Gauss Theorem, Continuity equation for current densities; Maxwell's equation in vacuum and non-conducting medium; Poynting vector.