Paper Code: PS03CPHY01	Total Credit: 4
Title Of Paper: Quantum Mechanics - II	

Unit	Description in detail	Weightage (%)
I	Brief introduction to representations and algebra of rotation Generators, Quantum theory of angular momentum and its eigen-value spectrum Matrix representation of angular momentum operators, spin angular momentum, Pauli matrices and their properties, total wave function, non-relativistic Hamiltonian including spin. Addition of angular momenta, definition of Clebsch-Gordan coefficients, Phase convention, spin-wave function for a system of two spin-$^1/_2$ particles, Identical particles with spin, addition of spin and orbital angular momenta.	25%
II	Evolution of system with time, the Schrödinger equation and general solution, propagators, sudden approximation, perturbative solution for transition amplitude, First and second order transition scattering of a particle by a potential Inelastic scattering, Harmonic perturbations, amplitude transition with, change of energy, Interaction of an atom with electromagnetic radiation, the Dipole approximation, dipole transition integral, $2p \rightarrow 1s$ and $2s \rightarrow 1s$ transitions, electromagnetic wave as harmonic oscillator and quantization, atom interacting with quantized radiation Scattering operator, the density matrix, spin density matrix, quantum Lioville equation and magnetic resonance; illustrative problems.	25%
III	Alternative pictures of time evolution, the Schrödinger picture the Heisenberg picture and the interaction picture. Relativistic wave equations, generalization of the Schrödinger equation, the Klein-Gordon equation and its plane wave solutions. Dirac's relativistic Hamiltonian and the Dirac equation, position probability density and expectation values, Dirac matrices, plane wave solution of the Dirac equation, the spin of the Dirac particles, significance of the negative energy states, Relativistic electron in central potential, electron in magnetic field and spin magnetic moment.	25%
IV	Matrix mechanics, creation and annihilation operations and their properties, number operator, solution of harmonic oscillator by creation and annihilation operators. Langrangian field theory, Canonical quantization, coordinates of the field and the classical field equations, Hamiltonian formulation, quantization of the field, non-relativistic field, system of Bosons and Fermions, Relativistic fields-The Klein-Gordon field and the Dirac field; Quantum Electrodynamics-Maxwell field theory.	25%

Basic Text & Reference Books:-

- A text book of Quantum Mechanics- By Mathews & Venkatesan
  TMH Publication Latest edition (2010)
- Quantum Mechanics by Schiff; McGraw Hill Publication
- Quantum Mechanics by V. K. Thankapan
- Quantum Mechanics by Ghatak & Loknathan; McMillan India Publication
- Lectures on quantum field theory by Ashok Das (World Scientific).