

SARDAR PATEL UNIVERSITY
Programme & Subject: M.Sc (Physics)
Semester: IV
Syllabus with Effect from: June - 2014

Paper Code: PS04EPHY05	Total Credit: 4
Title Of Paper: Theoretical Physics - II	

Unit	Description in detail	Weightage (%)
I	Principles of quantum dynamics, the evolution of probability and the time Development operator, The pictures of Quantum dynamics, the quantization postulates for a particle, canonical quantization and constants of the motion, canonical quantization in the Heisenberg picture, the forced harmonic oscillator. The quantum dynamics of a particle, the coordinate and momentum representations, the propagator in the co-ordinate representations.	25%
II	Feynman's path integral formulation of quantum dynamics in Direct product spaces and multiparticle systems, Bosons and Fermions – the simple harmonic oscillator, Annihilation and creation operators – coupled oscillators – three dimensional lattice and continuum limit, sources of a field and interaction between fields – Occupation number representation – second quantization. Fermion – Boson interaction.	25%
III	Perturbation theory – the Brillouin-Wigner series, the Heisenberg and interaction representations, Time-integral expansion series, S – matrix and its expansion, momentum representation, the physical vacuum, Dyson's equation and renormalization.	25%
IV	Green functions – The density matrix, equation of motion of density operator, The Kubo formula, the one particle green functions, energy – momentum representation, Evaluation of Green functions, Two-particle Green functions, time-independent green function, Matrix representation of Green functions.	25%

Basic Text & Reference Books:-

- Quantum Mechanics By Eugen Merzbacher (Third Edition)
- Elements of Advanced Quantum theory By J. M. Ziman
- Modern Quantum Mechanics By J. J. Sakurai
- Quantum Mechanics By Franz Schwabl

