



Phys 3301	QUANTUM MECHANICS-I	(CR3)
Preq.	Phys 2001	

Objectives

This course offers a systematic introduction to fundamental non-relativistic quantum mechanics.

Syllabus

From classical mechanics to quantum mechanics, mathematical tools, Hilbert Space, dimension, bases, orthonormal set, Dirac notation, operators on Hilbert space, Hermitian and unitary operators, representation in discrete bases, representation in continuous bases, position and momentum representation, postulates of quantum mechanics, the generalised uncertainty principle, evolution of state, Schrodinger equation and solutions, quantum simple harmonic oscillator, Hermite polynomials, Schrödinger's equation in three dimensions, central potentials and introduction to hydrogenic systems, energy eigenvalues and energy eigenstates, matrix representation of various operators, angular momentum and spherical harmonics, spherical harmonics, matrix representation of angular momentum, spin angular momentum and Pauli matrices, eigenfunctions of angular momentum, Hydrogen atom and Laguerre polynomials, transformations of states and operators, spatial translations, rotations, translations around, rotation of diatomic molecules, orbital angular momentum, wavefunctions for orbital angular momentum eigenstates, spin SO(3), SU(2) and their representations, the Stern-Gerlach experiment, precession in a magnetic field, composite systems, the tensor product of Hilbert spaces, addition of angular momenta, spin-orbit coupling.

Recommended Books

1. *Introduction to Quantum Mechanics* by D. J. Griffiths and D. F. Schroeter (3rd Ed), Cambridge, (2018)
2. *Introductory Quantum Mechanics* by R. Liboff (4th Edition), Addison-Wesley (2002)
3. *Quantum Mechanics: Concepts and Applications* by N. Zettili (2nd Edition), Wiley (2009)
4. *Modern Quantum Mechanics* by J. J. Sakurai and Jim J. Napolitano (2nd Edition), Pearson (2010)
5. *An Introduction Quantum Mechanics* by W. Greiner, Addison Wesley (1980)