ADVANCE PHYSICS 2(QUANTUM MECHANICS-1)

PRE-REQUISITE: Undergraduate level Mechanics and Mathematics

INTRODUCTION: CREDITE HOURS: 4

This course covers the experimental basis of quantum physics. It introduces wave mechanics, Schrödinger's equation in a single dimension, and Schrödinger's equation in three dimensions.

COURSE OBJECTIVE:

It covers fundamental concepts of quantum mechanics: wave properties, uncertainty principles, Schrödinger equation, and operator and matrix methods. Basic applications of the following are discussed: one-dimensional potentials (harmonic oscillator), three-dimensional centro symmetric potentials (hydrogen atom), and angular momentum and spin. The course also examines approximation methods: variational principle and perturbation theory.

COURSE OUTLINE:

Breakdown of Classical Concepts and Old Quantum Theory: Particle aspects of radiation and Planck's hypothesis, wave aspects of matter and de Broglie's hypothesis, discrete levels and Bohr's hypothesis.
Farmulation of Quantum Mechanics: Mathematical preliminaries, quantum mechanical wavefunction, Hilbert space, observables and operators, operator equations, the eigenvalue equation, commutation relations, expectation value, postulates of quantum mechanics, correspondence principle, complimentarity principle, Schrodinger equation and discrete energy levels, state functions and overlap integral, uncertainty principle.
One Dimensional Systems: The potential step, reflection and transmission coefficients, potential well and bound states, potential barrier, tunneling, tunneling through thin films, alpha decay, one-dimensional models of molecules and delta function potential, Kronig-Penny model, harmonic oscillator, raising and lowering operators.
Angular Momentum: Angular momentum operator, z-component, total angular momentum; eigenvalves, eigenfunctions and vector diagram, parity.

Evaluation Criteria

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

REFERENCE BOOKS:

1. Introductory Quantum Mechanics by R. L. Lieboff` Holden-Day, San Francisco (1980)
2. Qunatum Mechanics Vol I,II by C.Cohen-Tannoudji, B. Diu, F. Laloe, Wiley (1977).
3. Quantum Physics by S. Gasiorowicz, Wiley (1996).
4. Introduction to Quantum Mechanics by Dicke, Wittke, Addison-Wesley (1974).
5. Quantum Mechanics by Sokoev, Ternou, Holt, Rinehart & Winston (1996).
6. Quantum Mechanics by J. L. Powell and B. Crasemann, Addison-Wesley, (1961).