ADVANCE PHYSICS 5(QUANTUM MECHANICS-2)

PRE-REQUISITE: Quantum Mechanics I

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.

TOPICS COVERED:

1. **Central Potential:**
2. **Spin and Statistics:**
3. **Approximation Methods in Quantum Mechanics:**
4. **Formal Theory of Quantum Systems:**

COURSE OUTLINE:

Central Potential:
Motion in a central potential, the hydrogen atom, energy spectrum, quantum numbers and degeneracies.
Spin and Statistics:
The Zeeman effect, matrix operators, spin statistics and exclusion principle, Pauli's two components formalism, identical particles, fermions and bosons, symmetry and antisymmetry of wavefunctions.
Approximation Methods in Quantum Mechanics:
Time independent perturbation theory, simple applications, damped linear harmonic oscillator, hydrogen like atoms in magnetic field, time dependent perturbation theory, transition probability, emission and absorption of radiation, WKB approximation and its applications, variational method and its applications.
Formal Theory of Quantum Systems:
Hilbert space, operators and state vectors, bras and kets, orthonormality, Dirac delta-function, completeness, expectation value, degeneracy, compatible and incompatible observables, discrete and continuous spectra generalized uncertainty relation,

harmaonic oscillator, ladder operators, Schrodinger's equation of motion, Heisenberg's equations of motion, constants of motion, parity, conservation laws and invariance.

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).