Details of Course

Course Title	Course Structure			Pre-Requisite
Quantum Mechanics -B.Tech. EP III Sem Lesson Plan	**L**	**T**	**P**	
	3	**1**	**0**	

Course Objectives
This course focusses on developing the understanding of basic principles of quantum mechanics and their applications to some standard physical systems. The students will be equipped with necessary tools to explain, analyse, and predict a variety of quantum phenomena.

Course Outcomes (CO)

1. To understand the need of Quantum Mechanics.
2. To apply the key concepts and principles of quantum physics and solve the Schrödinger equation for standard systems.
3. To relate the matrix formalism to the use of basis states, and solve simple problems in that formalism.
4. To analyse the theory of angular momentum through some selected problems in quantum mechanics.
5. To apply the approximation techniques to find the solution of some typical quantum mechanical systems.

S. No.	Content	Contact Hours
Unit 1	**Origins of Quantum Physics:** A thought experiment, wave function and wave equation. Postulates of quantum mechanics: wave functions, Schrödinger equation, observables, and operators. Application of Schrödinger equation in 1-D: particle in an infinite square well; quantum harmonic oscillator.	8
Unit 2	**Mathematical Tools of Quantum Mechanics:** Linear vector space, Dirac notations, Matrix representation of Observables and states, Determination of eigenvalues and eigenstate for observables using matrix representations, Change of representation and unitary transformations, Coordinate and momentum representations, Equations of motion in Schrödinger and Heisenberg pictures.	10
Unit 3	**3 D problems:** Central potential, Particle in 3D box, Particle in a spherical box, Harmonic oscillator, Hydrogen atom	8
Unit 4	**Angular Momentum:**	8

	Quantum theory of angular momentum: Raising and lowering operators, eigenvalues and eigenfunctions, Spin angular momentum, Symmetry, invariance and conservation laws, relation between rotation and angular momentum, commutation rules, Matrix representations.	
Unit 5	**Approximation Techniques:** Time-independent Perturbation theory (non-degenerate and degenerate) and applications (some simple cases); Variational method and its applications to hydrogen atom; WKB approximation and applications to simple cases.	8
	Total	42

Books:

S. No.	Name of Books/Authors/Publisher
1.	"Introduction to Quantum Mechanics" by D. J. Griffiths, 2nd Edition, Benjamin Cummings (2004).
2.	Quantum Mechanics Concepts and Applications by Nouredine Zettili John Wiley & Sons (2009)
3.	"Principles of Quantum Mechanics" by R. Shankar Springer (1994)