

Module Code: MATH-409  
Module Title: **Quantum Mechanics-I**  
Module Rating: 3 Cr. Hours

### **Inadequacy of Classical Mechanics**

- Black body radiation
- Photoelectric effect
- Compton effect
- Bohr's theory of atomic structure
- Wave-particle duality
- The de Broglie postulate
- Heisenberg uncertainty principle

### **The Postulates of Quantum Mechanics: Operators, Eigenfunctions and Eigenvalues**

- Observables and operators
- Measurement in quantum mechanics
- The state function and expectation values
- Time development of the state function (Schrödinger wave equation)
- Solution to the initial-value problem in quantum mechanics
- Parity operators

### **Preparatory Concepts: Function Spaces and Hermitian Operators**

- Particle in a box
- Dirac notation
- Hilbert space
- Hermitian operators
- Properties of Hermitian operators

### **Additional One-Dimensional Problems: Bound and Unbound States**

- General properties of the 1-dimensional Schrodinger equation
- Unbound states
- One-dimensional barrier problems
- The rectangular barrier: Tunneling

### **Recommended Books**

1. H. D. Dehmen, *The Picture Book of Quantum Mechanics* (Springer, 2001).
2. H. F. Hameka, *Quantum Mechanics: A Conceptual Approach* (Wiley-IEEE, 2004).
3. R. L. Liboff, *Introductory Quantum Mechanics* (Addison-Wesley Publishing Co., 2003).
4. V. K. Thankappan, *Quantum Mechanics* (New Age Publishers, 1993).
5. D. R. Bès, *Quantum Mechanics: A Modern and Concise Introductory Course* (Springer, 2004).



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