

Syllabus B.Sc. (Physics) (Semester- IV)

Name of the Course: S.Y.B.Sc. SEM- IV - Paper I
MJ-5:Introduction to Quantum Mechanics and Modern Physics (2 Credits)

Sr. No.	Heading	Particulars
1.	Description the course : Including but Not limited to:	Introduction, relevance, Usefulness, Application, interest, connection with other courses, demand in the industry, job prospects etc.
2.	Vertical :	Major /Minor/Open Elective /Skill Enhancement / Ability Enhancement/Indian Knowledge System
3.	Type :	Theory / Practical
4.	Credits :	4 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5.	Hours	30 Hours
6	Marks Allotted:	50 Marks
	Course Objectives (CO): After successful completion of this course students will be able to: CO1.Understand Blackbody Radiation, Planck's Quantum Theory, Einstein's Photoelectric Effect. CO 2. Comprehend Phase and Group Velocities, Diffraction of Particles,Wave Packet and able to solve problems on it. CO 3.Understand Schodinger's Wave Equation, Heisenberg Uncertainty and problems. CO4. Explain Schrodinger's 1D time dependent wave and time independent wave equation, Physical interpretation of wave function. CO5.Describe Operators in Quantum Mechanics, Eigen Function, Eigen Value, Expectation Values and able to solve problems on it.	
	Course Outcomes (OC): After successful completion of this course OC 1. Students understand Blackbody Radiation, Planck's Quantum Theory. Einstein's Photoelectric Effect and able to solve problems on it. OC2. Students will develop the knowledge of Einstein's Photoelectric Effect, De-Broglie Hypothesis and able to solve problems on it. OC3. Students Comprehend the Schodinger's Wave Equation, Heisenberg Uncertainty Principle. OC4. Understand Schrodinger's 1D time dependent wave and time independent wave equation, Physical interpretation of wave function. OC5. Comprehend Operators in Quantum Mechanics, Eigen Function, Eigen Value, Expectation Values and able to solve problems on it.	
1	Unit I: Modern Physics	(15 Lectures)
	Blackbody Radiation, Failure of Classical Physics to Explain Energy Distribution in the spectrum of a Black Body, Planck's Quantum Theory, Einstein's Explanation of	

	Photoelectric Effect, Wave- particle duality, De-Broglie Hypothesis for Matter Waves, Concept of Phase and Group Velocities, Diffraction of Particles, Interference of Electrons, Wave Packet, Problems.
2	Unit II: Quantum Mechanics (15 Lectures)
	Schrodinger's Wave Equation, Heisenberg Uncertainty Principle, Elementary proof of Heisenberg Uncertainty Relation, Elementary Proof of Uncertainty Relation between Energy and Time, Schrodinger's 1D time dependent wave equation, Schrodinger's 1D time independent wave equation, Physical interpretation of wave function, Operators in Quantum Mechanics, Eigen Function, Eigen Value, Expectation Values, Postulates of Quantum Mechanics, particle in box, Problems.
	References: 1. Elements of Quantum Mechanics, Kamal Singh, S.P. Singh, S.Chand Publishing, 2005. 2. Concepts of Modern Physics – A. Beiser (6th Ed.) Tata McGraw Hill. 3. Quantum Mechanics – S P Singh, M K Bagade, Kamal Singh, - S. Chand: 2004 Ed. Additional References: 4. Quantum Mechanics of Atoms, Molecules, Solids, Nuclei and particles. - By R. Eisberg and R. Resnik Published by Wiley. 5. Introduction to Quantum Mechanics. - By D. Griffiths Published by Prentice Hall. Additional References: 6. Quantum Mechanics. - By Ghatak and Lokanathan Published by Mc. Millan. 7. Quantum Mechanics. - By L. I. Schiff. 8. Quantum Mechanics. - By Powell and Crasemann, Addison-Wesley Pub.