Semester Lecture Plan

Name of the college: Government College of Arts, Science & Commerce, Sanquelim-Goa

Name of Faculty: Mahendra R. Pednekar	**Subject:** Physics Core	
Paper code: PHY-305	**Program/Course: T.Y. B.Sc.**	**Division:**
Academic year: 2025 - 2026	**Semester: VI**	**Total Lectures: 60**

Course Objectives:

1. To study De Broglie hypothesis and give evidence.
2. To study wave function and give its representation.
3. To state and understand Heseinberg's uncertainty principle and its uses.
4. To formulate Schrodinger's wave equation.
5. To study applications of Schrodinger's equation.

Course Learning Outcome: The students will be able to

1. Understand the concept of De Broglie hypothesis and explain with the help of some experiments.
2. Derive equation of wave function and explain the concept of wave group.
3. State and explain Heisenberg's uncertainty principle and illustrate with examples.
4. Derive Schrodinger's time dependent and time independent wave equation.
5. Apply Scrodinger's equation to solve problems like particle in one dimensional potential well, step potential , potential barrier, simple harmonic oscillator etc.

Month	Lectures From:	To:	No. of lectures allotted	Topic, Subtopic to be covered	Learning outcome	ICT Tools	Reference books
December	01.12.25	06.12.25	04	De Broglie's hypothesis, Review of the Bohr's postulate about stationary states in the light of De	1.State and explain De Broglie hypothesis 2.Understand Bohr's 2nd postulate in the		

				Broglie's hypothesis, The concept of quantum (particle) nature of radiation. Demonstration of wave nature of particles-Davisson Germer experiment, e	light of De Broglie hypothesis. 3. Give experimental evidence for De Broglie hypothesis. 4. discuss the quantum nature of radiation.		
December	08.09.21	13.12.25	04	, electron diffraction experiment of G.P.Thomson, Dual nature of radiation/matter. Complimentary in Duality.	1.Discuss electron diffraction experiment of G.P.Thomson. 2.Describe the concept of dual nature of radiation/matter, concept of complementary in duality.		
December	18.12.25	23.12.25	03	Representation of a De Broglie wave, Velocity of De Broglie wave, Construction of a wave group, Wave packet and its motion in one dimension., Group velocity and particle velocity,	1.Express De Broglie wave mathematically. 2.Describe construction of wave group. 3. Discuss particle velocity, phase velocity and group velocity.		
January	02.01.26	10.01.26	05	, Max Born's interpretation of the wave function,	1.Explain the significance of Max Born		

				probability concept, Acceptable wave function, Normalization of wave function.	interpretation of wave fuction. 2.Define normalized wave fuction.		
January	12.01.26	17.01.26	04	Heisenberg's Uncertainty Principle Limitation of wave mechanics to predict the physical state of a particle/system accurately. Heisenberg Uncertainty principle.	1.State and explain Heisenberg's uncertainty principle.		
January	19.01.26	24.01.26	04	Illustration by thought experiments (γ - ray microscope, single slit diffraction and double slit experiment), Applications of Heisenberg Uncertainty principle.	1.Discuss applications of Heisenberg;s uncertainty principle. 2.Discuss gamma ray microscope experiment.		
January	27.01.26	31.01.26	04	**Schroedinger's Wave EquationWave** equation for De Broglie waves and Schroedinger's time dependent wave equation, Concept of stationary states.	1.Derive Schrodinger's time dependent wave equation.		

February	02.02.26	07.02.26	04	Schroedinger's time independent equation. Postulates of Quantum mechanics,	2. Discuss steady state . 3.Derive Schrodinger's time independent wave equation.		
February	09.02.26	14.02.26	04	Definition of operators & their necessity, Expectation values,	1.Define operator and expectation values. 2.Discuss the concept of expectation values.		
February	16.02.26	21.02.26	04	Extraction of information from solutions in terms of expectation values of physical variables/observable. Eigen value equation, Commutation relations.	1.Explain the terms eigen values and eigen functions 2.Discuss commutation equations.		
February	23.02.26	28.02.26	04	Applications of Schrödinger's Time Independent Wave Equation. Free particle, Infinite square well potential: Energy eigen functions and eigen values,	1.Discuss the behaviour of a particle in a infinite square well potential. 2.Discuss the energy eigenvalues and wave functions of a particle in a box.		

March	2.03.26	07.03.26	04	One dimensional finite square step potential of height Vo: Comparison of classical and quantum mechanical results for particle energy E>Vo and E	1.study the behaviour of a particle approaching one dimensional step potential of height Vo; classically and quantum mechanically		
March	09.03.26	14.03.26	04	Rectangular potential barrier and penetration through it, tunnel effect, Qualitative discussion of alpha decay,	1. Study the behaviour of a particle approaching a potential barrier. 2. Applications : alpha decay.		
March	16.03.26	21.03.26	04	tunnel diode & scanning tunneling microscope. Simple Harmonic Oscillator	1.Study the applications of potential barrier problem: tunnel diode and scanning tunneling microscope. 3. Discuss simple harmonic oscillator problem.		
	23-03-26	28-03-26		Simple Harmonic Oscillator – Energy			

March				eigen values and eigen functions (Operator method), Calculation of <x> and <px>, <x2> and <px 2>.	1.Develop Schrodinger's equation for simple harmonic oscillator . 2. Discuss the solution of Schrodinger;s equation for simple harmonic oscillator. 3.Derive expressios for energy eigen values and eigen functions for SHO. 4.Explain the significance of zero point energy.		
March	30.03.26	31.03.26	05	Particle in a three dimensional box, Concept of degeneracy	1.Derive relation for particle in three dimensional box. 2. Discuss the concept of degeneracy.		