Lecture Plan

Name of the College: Government College of Arts, Science and Commerce. Sanquelim - Goa

Name of Faculty: Vidhita Parab	**Subject:** Physics	
Paper code: PYD101	**Program: T.Y.B.Sc**	**Division:**
Academic year: 2024-25	**Semester: V**	**Total Lectures: 60**

Course Objectives:
To understand Quantum mechanics and solve problems and apply concept to higher level conceptual physics

Course Outcome: 1. Explain the concept of matter and state De Broglie hypothesis. Describe experiments in support of De Broglie hypothesis.
2. describe the concept of wave function, acceptable wave function, max born interpretation of wave function, wave group, group velocity, particle and phase velocity. Heisenberg's uncertainity principle.
3. Develop schrodinger's time dependent wave equation and hence explain the concept of stationary states, operators, eigen value and eigen functions.
4. derive schrodinger's time independent wave equation and use it to study behaviour of particle in an infinite square well potential, particle in a three dimensional box, particle approaching step potential, particle moving across potential barrier and harmonic oscillator.

Student Learning Outcome: Able to understand Quantum mechanics and solve problems and apply concept to higher level conceptual physics

Month	Lecture From	Lecture To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books
June- july	28-06-2024	06-07-2024	5	De-brogie's hypothesis			

				Review of the bohr's postulate about stationary states in the light of De broglie's hypothesis			1. Arthur Beiser, Concepts of Modern Physics, 5th Edition, McGraw Hill (1995). 2. Arthur Beiser, Perspectives of Modern Physics, 5th Edition, McGraw Hill (1995). 3. P.S. Bangui & others, New Course in Physics, Sheth Publishers. 4. F.K. Richtmayer, E.H.Kennard, J.N. Cooper, Introduction to Modern Physics (1969). 5. H. Semat and J.R.Albright, Introduction to Atomic and nuclear Physics, HRW (1972). 6. Ghatak and Lokanathan, Quantum
				The concept of quantum nature of radiation			
				Demonstration of wave nature of particles- Davission germer experiment			
				electron diffraction experiment of G.P.Thomson			
	08-07-2024	13-07-2024		Dual nature of radiation/matter			
				Complimentary in Duality			
				Representation of a De Broglie wave Velocity of De Broglie wave,			
			4	Construction of a wave group, Wave packet and its motion in one dimension.,			
	15-07-2024	20-07-2024	1	Group velocity and particle velocity			
			4	Max Born‟s interpretation of the wave function, probability concept			

				Acceptable wave function, Normalization of wave function			Mechanics, Theory and Applications, Mc Millan (2004).
				Limitation of wave mechanics to predict the physical state of a particle/system accurately			
	22-07-2024	27-07-2024	4	Heisenberg Uncertainty principle			
				Illustration by thought experiments (γ - ray microscope)			1. Arthur Beiser, Concepts of Modern Physics, 5th Edition, McGraw Hill (1995). 2. Arthur Beiser, Perspectives of Modern Physics, 5th Edition, McGraw Hill (1995). 3. P.S. Bangui & others, New Course in Physics, Sheth Publishers. 4. F.K. Richtmayer, E.H.Kennard, J.N. Cooper, Introduction to
				single slit diffraction and double slit experiment			
				Applications of Heisenberg Uncertainty principle.			
August	29-07-2024	03-08-2024	4	Wave equation for De Broglie waves and Schrodinger's time dependent wave equation			
				Concept of stationary states.			
				Schroedinger‟s time independent equation			
				Postulates of Quantum mechanics,			
	05-08-2024	10-08-2024		Definition of operators & their necessity			
			4	Expectation values,			

				Extraction of information from solutions in terms of expectation values of physical variables/observable			Modern Physics (1969). 5. H. Semat and J.R.Albright, Introduction to Atomic and nuclear Physics, HRW (1972). 6. Ghatak and Lokanathan, Quantum Mechanics, Theory and Applications, Mc Millan (2004).
				Eigen value equation			
	12-08-2024	17-08-2024	4	Commutation relations.			
				Free particle			
				Infinite square well potential: Energy eigen functions and eigen values			1. Arthur Beiser, Concepts of Modern Physics, 5th Edition, McGraw Hill (1995). 2. Arthur Beiser, Perspectives of Modern Physics, 5th Edition, McGraw Hill (1995). 3. P.S. Bangui & others, New Course in Physics, Sheth Publishers. 4. F.K. Richtmayer,
				One dimensional finite square step potential of height Vo: Comparison of classical and quantum mechanical results for particle energy E>Vo			
	19-08-2024	24-08-2024		One dimensional finite square step potential of height Vo: Comparison of classical and quantum mechanical results for particle energy E<Vo			

			4	Rectangular potential barrier and penetration through it			E.H.Kennard, J.N. Cooper, Introduction to Modern Physics (1969). 5. H. Semat and J.R.Albright, Introduction to Atomic and nuclear Physics, HRW (1972). 6. Ghatak and Lokanathan, Quantum Mechanics, Theory and Applications, Mc Millan (2004).
				tunnel effect			
				Qualitative discussion of alpha decay			
	26-08-2024	31-08-2024		tunnel diode			
				scanning tunneling microscope			
				Simple Harmonic Oscillator – Energy eigen values and eigen functions (Operator method)			
				Simple Harmonic Oscillator – Energy eigen values and eigen functions (Operator method)			
September	02-09-2024	05-09-2024		Calculation of $\langle x \rangle$ and $\langle p_x \rangle$,			
				Calculation of $\langle x^2 \rangle$ and $\langle p_x^2 \rangle$.			
				Particle in a three dimensional box			
			4	Concept of degeneracy			
	13-09-2024	14-09-2024	0				
	16-09-2024	21-09-2024		Problem solving			
				Problem solving			1. Arthur Beiser, Concepts of Modern Physics, 5th Edition,
				Problem solving			
			4	Problem solving			
	23-09-2024	28-09-2024		Problem solving			
			4	Problem solving			

				Problem solving			McGraw Hill (1995). 2. Arthur Beiser, Perspectives of Modern Physics, 5th Edition, McGraw Hill (1995). 3. P.S. Bangui & others, New Course in Physics, Sheth Publishers.
				Problem solving			
October	30-09-2024	05-10-2024		Problem solving			
				Problem solving			
			3	Problem solving			
	07-10-2024	12-10-2024		Problem solving			
				revision			
				revision			
			4	revision			
	14-10-2024	22-10-2024		revision			
				revision			
				Revision			
			4	Revision			

Assessment Rubrics

Component	Max Marks
ISA 1	10
ISA 2	10
Practical	
Project	
Semester End Exam	80