

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI
COURSE PLAN (June - November 2026)

Department : Physics
Name/s of the Faculty : Dr. M. Asisi Janifer
Course Title : QUANTUM MECHANICS I
Course Code : 23PH/PC/QM34
Shift : II

COURSE OUTCOMES (COs)

COs	Description	CL
CO1	acquire in-depth knowledge of the fundamental and advanced principles in quantum mechanical aspect.	K1
CO2	explain the theory of Schrodinger and Heisenberg representation, perturbation methods, orbital and intrinsic angular momentum along with scattering analysis.	K2
CO3	examine the significance of Dirac's notation, unitary transformations, variation principle, Pauli's spin matrices and born approximation in scattering.	K3
CO4	analyze the gained knowledge to derive expression for linear harmonic oscillator, anharmonic oscillator, general angular momentum and mass coordinate systems.	K4
CO5	solve problems in physics utilizing theoretical concepts in quantum mechanics.	K5
	CL – Cognitive Level K1 – Remember K2 – Understand K3 – Apply K4 – Analyze K5 – Evaluate	

Week	Unit No.	Content	Cognitive Level	Teaching Hours	COs	Teaching Learning Methodology	Assessment Methods
Jun 15 – 22,	1: General Formalism and	1.1 Interpretation of wave function – Time	K1-K5	5	CO1-CO5	Chalk and talk,	AI based Quiz and

2026 (Day Order 1-6)	One-Dimensional Energy Eigen Value Problem	dependent Schrodinger equation – Time independent Schrodinger equation - Linear vector space –Linear operator– Eigen functions and eigen values -Hermitian operator -				presentation	Group Discussion
Jun 23 – July 1, 2026 (Day Order 1- 6)		Postulates of quantum mechanics - Simultaneous measurability of observables -General uncertainty relation Dirac's notation – Equations of motion - Momentum representation 1.2 Square–well potential with rigid walls	K1-K5	5	CO1-CO5	Black board and presentation	Formative analysis and problem-solving hackathon
July 2 – July 8, 2026 (Day Order 1- 6)		Square well potential with finite walls – Square potential barrier – Alpha emission – Bloch waves in a periodic potential- Kronig-penny square well periodic potential –	K1-K5	5	CO1-CO5	Lecture and presentation	AI based Quiz and simulation tools
July 9 – 16, 2026 (Day Order 1- 6)	2 : Three-Dimensional Energy Eigen	Linear harmonic oscillator: Operator method 2.1 Particle	K1-K5	4	CO1-CO5	Lecture and presentation	Peer Assessment

	Value Problems and Matrix Formalism	moving in a spherically symmetric potential – System of two interacting particles – Rigid rotator - Hydrogen atom.					
July 17 – 24, 2026 (Day Order 1- 6)		Matrix representation of wave function – Matrix representation of operators –Schrodinger equation in matrix form – Eigen value problems – Unitary transformations–	K1-K5	5	CO1-CO5	Lecture and presentation	Slip test
July 25 – 28, 2026 (Day Order1- 3)	3: Approximation Methods	Harmonic oscillator: matrix method - matrix representation of spin – Pauli matrices- Spinors and expectation values – Precession of an electron in a magnetic field. Basic concepts of time independent perturbation theory	K1-K5	3	CO1-CO5	Lecture and video session	Third Component 1 THEORY TEST Units 1 and 2 [20 marks] – K5
Aug 4 - 6, 2026 (Day Order 4 - 6)		Non degenerate energy levels – First order and second order correction to energy and wave function 3.2 Anharmonic oscillator: first order correction, ground state	K1-K5	3	CO1-CO5	Black board and presentation	AI based Quiz and simulation tools

		of Helium and hydrogen					
Aug 7 – 14, 2026 (Day Order 1-6)		Degenerate energy levels – Stark effect – Spin-Orbit interaction - Variational principle- Variation method for excited states - WKB method.	K1-K5	5	CO1-CO5	Lecture and presentation	Slip test
Aug 17 - 24, 2026 (Day Order 1-6)	4: Angular momentum	4.1 Angular momentum operator–Commutation relation– Eigen values and Eigen functions of L^2 and L_z	K1-K5	4	CO1-CO5	Black board and presentation	Peer assessment
Aug 25 – Sep 2, 2026 (Day Order 1-6)		General angular momentum – Eigen states and eigen values of J^2 and J_z – Angular momentum matrices 4.2 Spin angular momentum	K1-K5	5	CO1-CO5	Lecture and presentation	Formative analysis and problem-solving hackathon
Sep 3 – 11, 2026 (Day Order 1-6)		Spin vectors for spin half systems –Addition of angular momenta - Clebsch-Gordan coefficients.	K1-K5	5	CO1-CO5	Lecture and presentation	Quiz
Sep 15-17, 2026 (Day Order 1 - 3)	5: Scattering Theory and Applications	Scattering cross section – Scattering amplitude– Partial waves–Scattering by a central potential:	K1-K5	3	CO1-CO5	Lecture and video session	Third Component 2 Power Point

		Partial wave analysis					Presentation with report – 15 marks All units - K3
Sep 18 –23, 2026	C.A. Test - II						
Sep 24 - 28, 2026 (Day 4 – 6)		Scattering by an attractive square well potential - Scattering length	K1-K5	3	CO1-CO5	Lecture and presentation	Group discussion and mock test
Sep 29 – Oct 7, 2026 (Day Order 1 - 6)		Born approximation – Scattering by screened Coulomb potential	K1-K5	5	CO1-CO5	Lecture and presentation	Third Component 3 Problem test with list of formulas - All units [15 marks] K4
Oct 8 - 14, 2026 (Day Order 1 - 6)		Validity of Born approximation– Laboratory and Centre of mass coordinate systems.	K1-K5	5	CO1-CO5	Lecture and presentation	Slip test
Oct 15 - 21, 2026 (Day Order 1- 4)	REVISION						

