STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI
COURSE PLAN June - November 2024

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 inquantum mechanical aspect.	K1
CO2	Explain the theory of Schrodinger and Heisenberg representation, perturbationmethods, 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	Analyse the gained knowledge to derive expression for linear harmonicoscillator, anharmonic oscillator, general angular momentum and masscoordinate systems.	K4
CO5	Solve problems in physics utilizing theoretical concepts in quantummechanics.	K5

Week	Unit No.	Content	Cognitive Level	Teaching Hours	COs	Teaching Learning Methodology	Assessment Methods
Jun 24 – 26, 2024(Day Order 4 - 6)	I	Interpretation of wave function – Time dependent Schrodinger equation – Time independent Schrodinger equation - Linear vector space –Linear operator–Eigen functions and eigen values -Hermitian operator	K1-K5	4	CO1-CO5	Lecture – Chalk and Talk method	Group Discussion and short test
Jun 27 – July 4, 2024(Day Order 1 - 6)		Postulates of quantum mechanics -Simultaneous measurability of observables -General uncertainty relation Dirac's notation – Equations of motion - Momentum representation-Square–well potential with rigid walls	K1-K5	5	CO1-CO5	Lecture and power point presentation	Problem solving
July 5 – 12, 2024 (Day Order 1 - 6)	I	Square well potential with finite walls – Square potential barrier – Alpha emission – Bloch waves in a periodic potential – Kronig-penny square well periodic potential – Linear harmonic oscillator: Operator method	K1-K5	4	CO1-CO5	Lecture and video session	Quiz and short test
July 15 – 23, 2024(Day Order 1 - 6)	II	Particle moving in a spherically symmetric potential –System of two interacting particles –Rigid rotator - Hydrogen atom. Matrix representation of wave function – Matrix representation of operators	K1-K5	5	CO1-CO5	Lecture – Chalk and talk method	Third component
July 24 – 31,	II	Schrodinger equation in matrix form – Eigen value problems Unitary transformations– Harmonic	K1-K5	5	CO1-CO5	Lecture and demonstration	Open book assessment

2024 (Day Order 1 - 6)		oscillator: matrix method - matrix representation of spin – Pauli matrices- Spinors and expectation values				video	
Aug 1 – 5, 2024(Day Order 1 - 3)	II,III	Precession of an electron in a magnetic field. Basic concepts of time independent perturbation theory – Non degenerate energy levels	K1-K5	2	CO1-CO5	Lecture and power point presentation	Discussion and problem solving
Aug 6 – 10, 2024		**C.A. Test - I**					
Aug 12 – 14, 2024(Day Order 4-6)	III	First order and second order correction to energy and wave function Anharmonic oscillator	K1-K5	3	CO1-CO5	Lecture and power point presentation	problem solving and discussion
Aug 16 – 23, 2024 (Day Order 1-6)	III	first order correction, ground state of Helium and hydrogen–Degenerate energy levels Stark effect – Spin-Orbit interaction - Variational principle-Variation method for excited states - WKB method.	K1-K5	5	CO1-CO5	Lecture and power point presentation	Questioning, problem solving
Aug 27 – Sep 3, 2024 (Day Order 1-6)	IV	Angular momentum operator–Commutation relation–Eigen values and Eigen functions of L^2 and L_z – General angular momentum	K1-K5	5	CO1-CO5	Lecture – Chalk and talk method	Questioning problem solving

Sep 4 – 11, 2024(Day Order 1-6)	IV	Eigen states and eigen values of J^2 and J_z– Angular momentum matrices	K1-K5	1	CO1-CO5	Lecture and power point presentation	Questioning and assessment using apps
Sep 12 - 20, 2024 (Day Order 1-6)	IV	Spin angular momentum –Spin vectors for spin half systems –Addition of angular momenta - Clebsch-Gordan coefficients.	K1-K5	5	CO1-CO5	Lecture and demonstration	Third component test
Sep 23 - 26, 2024 (Day Order 1-4)	V	Scattering cross section –Scattering amplitude	K1-K5	3	CO1-CO5	Lecture and power point presentation	Group discussion and Quiz
Sep 27 – Oct 3, 2024	**C.A. Test – II**						
Oct 4 – 5, 2024 (Day 5 & 6)	V	Partial waves–Scattering by a central potential: Partial wave analysis – Scattering by an attractive square well potential	K1-K5	1	CO1-CO5	Lecture and power point presentation	Group discussion and Quiz

Oct 7 - 15, 2024 (Day Order 1 to 6)	V	Scattering length Born approximation – Scattering by screened Coulomb potential	K1-K5	5	CO1-CO5	Lecture and power point presentation	Third component
Oct 16 - 22, 2024 (Day Order 1 to 6)	V	Validity of Born approximation–Laboratoryand Centre of mass coordinate systems.	K1-K5	5	CO1-CO5	Lecture and power point presentation	Questioning and Discussion
Oct 23 - 24, 2024 (Day Order 1 to 2)			**REVISION**				