CURRICULUM DEVELOPMENT PLAN: Mr. Kapil Kumar
B.Sc. (H) PHYSICS, Final Year, Semester VIII,
(Even Semester, 2025-2026,)
No. of Theory Periods per week = 3

Name of Paper & Code	Allocation of Lectures	Month-wise schedule followed by the Department	Tutorial/assignment/ Presentation etc.
Advanced Quantum Mechanics -II			
Unit :1 Approximation Methods for Stationary Systems: Time-independent perturbation theory up to second order perturbation for the non-degenerate case with applications to perturbed potential wells, linear harmonic oscillator with perturbed force constant ($k \rightarrow (1+\varepsilon)k$), charged harmonic oscillator in a weak electric field. First-order perturbation for anharmonic oscillator with cubic and quartic terms. Degenerate systems with application to spin-orbit coupling and fine structure of hydrogenic atom, Zeeman effect (weak and strong field). Variational method and its applications to the ground state of the simple harmonic oscillator and the helium atom, electron interaction energy and extension of the variational method to excited states.	14	January/February	• Syllabus Overview • Reference Books • Derivations • Problem solving • Assignments • Previous years Question Papers' problems • Students' difficulties
Unit :2 Approximation Methods for time-dependent perturbations: Interaction picture. Time-dependent perturbation theory (up to first-order perturbation). Transition probabilities, transition to a continuum of final states, Fermi's Golden Rule. Application to constant and harmonic perturbations. Sudden and adiabatic approximations	14	February/March	• Derivations • Problem solving • Assignments • Students' difficulties • Class Test • Previous years' Question Papers' problems

Unit :3 Scattering: Wave packet description of scattering, scattering amplitude, differential and total cross section. Lippmann-Schwinger Equations, Formal treatment of scattering by Green's function method. Born approximation and applications to central potentials. Definition and properties of the S-Matrix. Partial wave analysis: Asymptotic behaviour of partial waves, Phase shifts and angular momentum decomposition, Optical theorem and conservation of probability.	17	March-April	• Derivations • Related Problems • Students' difficulties • Previous years' Question Papers' problems • Revision session prior to Home Examinations