Part A: Introduction			
Program: **Diploma**	Class: **B.Sc.**	Semester: **Fifth**	Session:**2024-2025**
1	Course Code	**PSC – 05T**	
2	Course Title	**MODERN PHYSICS**	
3	Course Type	**Theory**	
4	Pre-requisite (if any)	As per norms	
5	Course Learning Outcomes (CLO)	**After completion of the course students will be able to:** • Understand reference systems, inertial frames, and Galilean invariance in classical mechanics. • Explain special relativity postulates, Lorentz transformations, and mass-energy equivalence. • Describe quantum theory origins, wave-particle duality, and uncertainty principle. • Analyze Schrödinger's equation, wave function interpretation, and quantum mechanics applications.	
6	**Credit Value**	**Theory : 3**	
7	**Total Marks**	**Max. Marks: 100**	**Min Passing Marks : 40**

a+

Part B: Content of the Course		
Total Hours: 45		
Unit	**Topic**	**Number of Hours**
I	Reference systems, inertial frames, Galilean invariance, propagation of light, Michelson-Morley experiment, search for ether Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition theorem, variation of mass with velocity, mass-energy equivalence, particle with a zero rest mass.	**12**
II	Origin of the quantum theory: Failure of classical physics to explain the phenomena such as black body spectrum, photoelectric effect, Compton effect Wave particle duality and uncertainty principle, de Broglie's hypothesis for matter waves; the concept of phase and group velocities, Experimental demonstration of matter waves Davisson and Germer's experiment. Consequence of de-Broglie's concepts, Bohr's complimentary principle, Bohr's correspondence principle, Bohr's atomic model, energies of a particle in a box, wave packets. Consequence of the uncertainty relation: gamma ray microscope, diffraction at a slit.	**11**
III	Quantum Mechanics: Schrodinger's equation, statistical interpretation of wave function, Orthogonality and normalization of wave function, probability current density, Postulatory basis of quantum mechanics; operators, expectation values, Ehrenfest's theorem, transition probabilities, application to particle in one and three dimensional boxes, harmonic oscillator in one dimension, reflection at a step potential, transmission across a potential barrier.	**11**
IV	Spectra of hydrogen, deuteron and alkali atoms, spectral terms, doublet fine structure, screening constants for alkali spectra for *s*, *p*, *d* and *f* states, selection rules. Discrete set of electronic energies of molecules, quantization of vibrational and rotational energies. Determination of internuclear distance, pure rotational and rotation vibration spectra. Dissociation limit for the ground and other electronic states, transition rules for pure vibration and electronic vibration spectra. Raman effect, Stokes and anti-Stokes lines, complementary character of Raman and infrared spectra, experimental arrangements for Raman Spectroscopy.	**11**