Part A: Introduction			
Program: **Diploma**	Class: **B.Sc.**	Semester: **Fourth**	Session: **2023-2024**

1	Course Code	**PSE – 02T**	
2	Course Title	**FUNDAMENTALS OF 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 –** • Gain of advanced theoretical and experimental method including the use of numerical method • Understand the basic postulates of quantum mechanics • Gain knowledge about physical quantities as operators • Understand the Schrodinger equation and its applications • Gain knowledge about structure of nucleus, nuclear fission and fusion and be familiar of nuclear energy	
6	**Credit Value**	**Theory : 4 (Th-3 + Tutorial-1)**	
7	**Total Marks**	**Max. Marks: 100**	**Min Passing Marks : 40**

Part B: Content of the Course

Total Hours: 60

Unit	Topic	Number of Hours
I	Planck's quantum theory, Planck's constant and light as a collection of photons; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment. Problems with Rutherford model-instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra.	**15**
II	Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle, Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence.	**15**
III	Matter waves and wave function; probabilistic interpretation of wave function, Probability and probability current densities in one dimension. Normalization of wave function, Expectation value of dynamical variables, Operators: Position, Momentum and Energy operators; stationary states; probabilities and normalization; Schrodinger equation for non-relativistic particles.	**15**
IV	One dimensional infinitely rigid box- energy eigen values and eigen function, Quantum dot; Quantum mechanical scattering and tunneling in one dimension - across a step potential and across a rectangular potential barrier. Schrodinger equation in spherical polar co-ordinates, spherical symmetric potential, energy states of hydrogen using Schrodinger equation.	**15**

Part C - Learning Resource

Text Books, Reference Books, Other Resources

Reference Books:

- Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill