1.	Title of the course	Atomic and Molecular Physics
2.	Course number	PH601L
3.	Structure of credits	3-0-0-3
4.	Offered to	PG
5.	New course/modification to	Modification To PH6101/10
6.	To be offered by	Department of Physics
7.	To take effect from	July 2022
8.	Prerequisite	Nil
9.	**Course Objective(s):** To introduce the quantum structure of atoms, molecules and a few of their approximate theoretical descriptions. To discuss the probing of the atomic, molecular structure via interaction with electromagnetic fields and particle collisions.	
10.	**Course Content:** Spectra of one-electron systems, fine structure, hyper-fine structure and Lamb shift; SO(4) symmetry in Hydrogen atom; Spectra of many electron atoms, central field approximation, Thomas-Fermi model, Hartree-Fock method, L-S and J-J coupling, Wigner-Eckart theorem, density functional theory; Molecular structure: Born-Oppenheimer approximation, rovibrational structure; Resonances; Emission and absorption spectroscopy: UV-VIS-IR spectroscopy, microwave spectroscopy, line broadening; Raman spectroscopy; Laser cooling: atom and ion traps; Precision spectroscopy; Photoionization, electron impact processes.	
11.	**Textbook(s):** 1. Brandsen B H and Joachain C J, *Physics of Atoms and Molecules*, Prentice Hall (2003). 2. Friedrich H, *Theoretical Atomic Physics*, Springer (2017).	
12.	**Reference(s):** 1. Banwell C N and Mc Cash E N, *Fundamentals of Molecular Spectroscopy*, McGraw Hill Education (2017). 2. Budker D, Kimball D F and Demille D P, *Atomic Physics and Exploration through Problems and Solutions*, Oxford University Press (2004). 3. Demtroeder W, *Laser Spectroscopy: Basic Principles*, Springer, Vol. 1 (2008). 4. Pavia D L, *Introduction to Spectroscopy*, Cengage Learning India Private Limited (2015).	