

**Semester VIII**

<b>S.No</b>	<b>Course Code</b>	<b>Course Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	PH414T	<u>Atomic and Molecular Physics</u>	2	1	0	6
2		Institute Elective-IV	2	1	0	6
3		Program Elective-III	2	1	0	6
4		Institute Elective-V/PH502P: RnD Project-II	2	1	0	6
		<b>Total Credits</b>				<b>24</b>

1	<b>Title of the course (L-T-P-C)</b>	<b>Atomic and Molecular Physics (2-1-0-6)</b>
2	<b>Pre-requisite courses(s)</b>	PH101 Quantum Mechanics and Applications
3	<b>Course content</b>	<p>Recapitulation of quantum mechanics;</p> <p>One-electron atoms: energy levels, interaction with electromagnetic fields, transition rates, density of states, dipole approximation, Zeeman and Stark effects;</p> <p>Multi-electron atoms: Helium atom, central field approximation, Thomas- Fermi model of the atom, Hartree-Fock method, L-S and J-J coupling, interaction with external fields;</p> <p>Molecular structure: Born-Oppenheimer approximation, Electronic structure of molecules, Hydrogen molecule ion, molecular orbital (MO) theory, homo and hetero-nuclear diatomic molecules, electronic term symbols, valence bond (VB) theory of diatomic molecules, comparison of VB and MO theories;</p> <p>Molecular spectra: Rotational, Vibrational and Electronic spectra.</p>
4	<b>Texts/References</b>	<ol style="list-style-type: none"> <li>1. Physics of Atoms and Molecules, B. H. Bransden and C. J. Joachain, Pearson Education, Ltd. (2003).</li> <li>2. Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles, R. Eisberg and R. Resnick, John Wiley &amp; Sons, Inc. (1985).</li> <li>3. Atoms, Molecules and Photons, W. Demtroder, Springer-Verlag Berlin (2010).</li> <li>4. Fundamentals of Molecular Spectroscopy, C. N. Banwell and E. M. McCash, McGraw Hill Education (2013).</li> <li>5. Molecular Quantum Mechanics, P. Atkins and R. Friedman, Oxford University Press (2011).</li> <li>6. Quantum Chemistry, I. N. Levine, Pearson (2016).</li> </ol>