PPH203 ATOMIC AND MOLECULAR PHYSICS

L	T	P	Cr
3	1	0	3.5

Course Objectives: Objective of this course is to learn atomic, molecular and spin resonance spectroscopy.

One Electron Atom: Vector model of a one electron atom, Quantum states of an electron in an atom, Hydrogen atom spectrum, Spin-orbit coupling, Relativistic correction, Hydrogen fine structure, Spectroscopic terms, and Hyperfine structure.

Two valance Electron Atom: Vector model for two valance electrons atom, LS coupling, Pauli Exclusion Principle, Interaction energy for LS coupling, Lande interval rule, jj coupling, interaction energy for jj coupling.

Atom in Magnetic Field: Zeeman Effect, Magnetic moment of a bound electron, Magnetic interaction energy in weak field. Paschen-Back effect, Magnetic interaction energy in strong field.

Molecular Spectroscopy: Rotational and vibrational spectra of diatomic molecule, Raman Spectra, Electronic spectra, Born-Oppenheimer approximation, Vibrational coarse structure, Franck-Condon principle, Rotational fine structure of electronic-vibration transitions. Electron spin and nuclear magnetic resonance spectroscopy.

Course learning outcomes: Students will have achieved the ability to:

1. describe the atomic spectra of one and two valance electron atoms.
2. explain the change in behavior of atoms in external applied electric and magnetic field.
3. explain rotational, vibrational, electronic and Raman spectra of molecules.
4. Describe electron spin and nuclear magnetic resonance spectroscopy and their applications..

Recommended Books:

1. *White, H.E., Introduction to Atomic Spectra, McGraw Hill, (1934).*
2. *Banwell, C.N. and McCash, E.M., Fundamentals of molecular spectroscopy, Tata McGraw Hill, (2007).*

Evaluation Scheme:

Sr. No.	Evaluation Elements	Weightage (%)
1	MST	30
2	EST	45
3	Sessionals (May include assignments/quizzes)	25