FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF PHYSICS
COURSE CURRICULUM

PART-A: INTRODUCTION			
Program:Bachelor in Science *(Honors/Honors with Research)*		**Semester - VIII**	**Session: 2024-2025**
1	**Course Code**	PHSE- 10	
2	**Course Title**	**Atomic and Molecular Physics**	
3	**Course Type**	**Discipline Specific Elective**	
4	**Pre-requisite** (if, any)	**As per Program**	
5	**Course Learning. Outcomes (CLO)**	➤ Explain Vector atom model and use it for analyzing hydrogen spectra. ➤ Analyze various spectra and check for possibility of a given transition ➤ Explain and Apply Raman's effect and spectroscopy for various application. ➤ Appreciate the extraordinary characteristic of lasers and differentiate it from an ordinary light. ➤ Explore more about scientific contribution of Sir C V Raman		
6	**Credit Value**	**4 Credits**	*Credit = 15 Hours - learning & Observation*
7	**Total Marks**	Max. Marks: 100	Min Passing Marks: 40

PART -B: CONTENT OF THE COURSE

Total No. of Teaching–learning Periods (01 Hr. per period) – 60 Periods (60 Hours)

Unit	Topics (Course contents)	No. of Period
I	Vector atom model, quantum numbers associated with vector atom model, 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, singlet, triplet fine structure in alkaline earth spectra, L-S and J-J coupling	15
II	Different types of Spectra, Discrete set of electronic energies of molecules, quantization of vibrational energies, determination of inter-nuclear distance, Transition rules for vibration and electronic vibration spectra. Pure rotational and rotation vibration spectra, Quantization of States Dissociation limit for the ground and other electronic states, transition rules for pure rotation and electronic- rotation Spectra	15
III	Raman effect, Stokes and anti-Stokes lines, complimentary character of Raman and infrared spectra, experimental arrangements for Raman spectroscopy. Application of Raman Spectroscopy, Resonance Spectroscopy, X-Rays, Production of X-rays, X-ray spectra, Mosley's law, X-Ray Spectroscopy,	15
IV	Atom Radiation interactions: Semi-classical description of radiation. Absorption, spontaneous and stimulated emissions, Einstein's A and B coefficients, Coherent and Incoherent emissions, LASERs and MASERs, Line widths, various types of line broadening, two-level atoms in a radiation field	15
Keywords	Vector atom model, hydrogen spectra, electronic transitions, vibrational spectra, rotational spectra, Raman effect	

Signature of Convener & Members (CBoS) :

PART–C: LEARNING RESOURCES
Text Books, Reference Books and Others

Text Books Recommended –
1. Atomic Physics by J.B. Rajam
2. Molecular Spectroscopy by Ira N. Levine
3. Fundamentals of Molecular Spectroscopy by C.N. Banwell and E.M. McCash
4. Lasers: Theory and Applications by K. Thyagarajan and A.K. Ghatak
5. Spectroscopy by B.P. Straughan and S. Walker
6. Modern Spectroscopy by J. Michael Hollas.

Reference Books Recommended –
1. Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
2. Modern Physics, John R. Taylor, Chris D. Zafiratos, Michael A.Dubson,2009, PHI Learning
3. Modern Physics, R.A. Serway, C.J. Moses, and C. A. Moyer, 2005, Cengage Learning
4. Modern Physics, G. Kaur and G.R. Pickrell, 2014, McGraw Hill

Online Resources– e-Resources / e-books and e-learning portals
1. https://archive.nptel.ac.in/courses/115/105/115105100/
2. https://archive.nptel.ac.in/courses/115/101/115101003/#

PART -D: ASSESSMENT AND EVALUATION

Suggested Continuous Evaluation Methods:

Maximum Marks:	100 Marks
Continuous Internal Assessment(CIA):	30 Marks
EndSemester Exam(ESE):	70 Marks

Continuous InternalAssessment(CIA): (By Course Teacher)	Internal Test / Quiz-(2): **20 & 20** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz **+** obtained marks in Assignment shall be considered against **30** Marks
End Semester Exam (ESE):	Two section – A & B Section A: **Q1**. Objective – 10 x1= **10** Mark; **Q2**. Short answer type- **5x4 =20Marks** Section B: Descriptive answer type qts.,**1 out of 2** from each unit-4x10=**40 Marks**	

Name and Signature of Convener & Members of CBoS: