



**THIRD YEAR BACHLOR OF SCIENCE MAJOR
PHYSICS REVISED SYLLABUS ACCORDING TO
CBCS NEP 2020**

**COUERSE TITLE: ATOMIC AND MOLECULAR PHYSICS
SEMESTER: V
W.E.F. 2025-2026**

**Recommended by the Board of Studies in PHYSICS
And**

Approved by the Academic Council

Devrukh Shikshan Prasarak Mandal's

Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and
Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh.
Tal.Sangmeshwar, Dist. Ratnagiri-415804, Maharashtra, India

Semester V**Academic Council Item No: 02/2025**

Name of the Implementing Institute	:	Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal. Sangmeshwar, Dist. Ratnagiri-415804,
Name of the Parent University	:	University of Mumbai
Name of the Programme	:	Bachelor of Science
Name of the Department	:	Physics
Name of the Class	:	Third Year
Semester	:	Fifth
Paper	:	II
No. of Credits	:	02
Title of the Course	:	Atomic and Molecular Physics
Course Code	:	S302PHT
Name of the Vertical in adherence to NEP 2020	:	Major
Eligibility for Admission	:	Any student admitted to Third year of B. Sc, degree programme in adherence to Rules and Regulations of the University of Mumbai and Government of Maharashtra
Passing Marks	:	40%
Mode of Assessment	:	Formative and Summative
Level	:	5.5
Pattern of Marks Distribution for TE and CIA	:	60:40
Status	:	NEP-CBCS
To be implemented from Academic Year	:	2025-2026
Ordinances /Regulations (if any)		

Syllabus for Third Year of Bachelor of Science in Physics

(With effect from the academic year 2025-2026)

SEMESTER-V

Paper No.– Physics Paper – II

Course Title: Atomic and Molecular Physics

No. of Credits - 02

Type of Vertical: Major and Minor

COURSE CODE: S302PHT

Learning Outcomes Based on BLOOM's Taxonomy:

After completing the course, the learner will be able to...

Course Learning Outcome No.	Course Learning Outcome
CLO-01	apply principles of quantum mechanics in atomic physics
CLO-02	study the importance of electron spin, symmetric and antisymmetric wave functions and vector atom model
CLO-03	explain effect of magnetic field on atoms and its application
CLO-04	describe molecular physics and its applications.
CLO-05	understand usefulness of spectroscopy

Syllabus for Third Year of Bachelor of Science in Physics**(With effect from the academic year 2025-2026)****SEMESTER-V****Paper No.– II****Course Title: Atomic and Molecular Physics****No. of Credits - 02****Type of Vertical: Major****COURSE CODE: S302PHT**

COURSE CONTENT			
Module	Content	Credits	No. of Lectures
1	Hydrogen Atom Hydrogen atom: Schrödinger's equation for Hydrogen atom, Separation of variables, Quantum Numbers: Total quantum number, Orbital quantum number, Magnetic quantum number. Angular momentum. Ref — B: 9.1 to 9.9 Electron Spin Electron spin: The Stern-Gerlach experiment, Symmetric and Anti-symmetric wave functions. Ref –B: 10.1, 10.3. 2 Vector Atom Model Spin orbit coupling, Total angular momentum, Vector atom model, L-S and j-j coupling. Ref –B: 10.2, 10.6, 10.7, 10.8, 10.9.	01	15
2	Zeeman Effect Effect of Magnetic field on atoms, the normal Zeeman effect and its explanation (Quantum), The Lande g - factor, Anomalous Zeeman effect. Ref -B : 11.1 and 11.2 Spectra of diatomic molecule Molecular spectra (Diatomic Molecules): Rotational energy levels, Rotational spectra, Vibrational energy levels, Vibrational-Rotational spectra. Electronic Spectra of Diatomic molecules: The Born-Oppenheimer approximation, Intensity of vibrational-electronic spectra: The Franck-Condon principle.Ref- - B: 14.1, 14.3, 14.5, 14.7	01	15

	Raman Effect Raman effect: Quantum theory of Raman effect, Rotational Raman spectra, Vibrational Raman spectra, Experimental set up of Raman Effect. Ref. -BM: 6.11, 6.1.3. 2. B M: 4.1.1, 4.1.2, 4.2.1,4.2.2, 4.2.3, 4.3.1. GA: 8.6.1		
	Total	02	30

References:

1. **B:** Perspectives of Modern Physics : Arthur Beiser Page 8 of 18 McGraw Hill.
2. **BM:** Fundamentals of Molecular Spectroscopy : C. N. Banwell & E. M. McCash (TMH).(4th Ed.)
3. **GA:** Molecular structure and spectroscopy : G Aruldas (2nd Ed) PHI learning Pvt Ltd.
4. Atomic Physics (Modern Physics): S.N.Ghoshal. S.Chand Publication(for problems on atomic Physics).

Access to the Course

The course is available for all the students admitted for Bachelor of Science.

Methods of Assessment

The assessment pattern would be 60:40, 60% for Semester End Examination (SEE) and 40% for Continuous Internal Assessment (CIA). The structure of the SEE and CIA would be as recommended by the Board of Studies and approved by the Board of Examination and the Academic Council of the college.

Pattern of Evaluation

The Examination/Evaluation pattern shall be framed by the Board of Examination with its final approval from the Academic Council of the College.