Academic Council Item No:_____

Devrukh Shikshan Prasarak Mandal's

Nya. TATYASAHEB ATHALYE ARTS, Ved. S.R. SAPRE COMMERCE & Vid. DADASAHEB PITRE SCIENCE COLLEGE, DEVRUKH [AUTONOMOUS]

Syllabus for T.Y. B.Sc.
Program: B.Sc.
Course: Physics
Credit Based Semester and Grading System with the Effect from
Academic Year 2021-22

Syllabus for B.Sc. Physics (Theory and Practical)
As per credit based system
Third Year B.Sc.2021–2022.

The revised syllabus in Physics as per credit based system for the Third Year B.Sc. Course will be implemented from the academic year **2021–2022.**

Preamble:

The systematic and planned curricula from these courses shall motivate and encourage learners to understand basic concepts of Physics.

Objectives:

- To develop analytical abilities towards real world problems
- To familiarize with current and recent scientific and technological developments
- To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

SEMESTER V				
Theory				
Course	**UNIT**	**TOPICS**	**Credits**	**Lectures per Week**
USPH501	I	Mathematical Methods in Physics	**2.5**	**4**
	II	Mathematical Methods in Physics		
	III	Thermal and Statistical Physics		
	IV	Thermal and Statistical Physics		
USPH502	I	Solid State Physics	**2.5**	**4**
	II	Solid State Physics		
	III	Solid State Physics		
	IV	Solid State Physics		
USPH503	I	Atomic Physics	**2.5**	**4**
	II	Atomic Physics		
	III	Molecular Physics		
	IV	Molecular Physics		
USPH504	I	Electrodynamics	**2.5**	**4**
	II	Electrodynamics		
	III	Electrodynamics		
	IV	Electrodynamics		

Practicals			
USPHP05	Practicals of Course USPH501 + Course USPH502	**2.5**	**6**
USPHP06	Practicals of Course USPH503 + Course USPH504	**2.5**	**6**
Project			
USPHPR1	USPH501 + USPH502 + USPH503 + USPH504	**1**	**4**

Theory Course - USPH503: Atomic and Molecular Physics

Learning Outcome: Upon successful completion of this course, the student will understand

- the application of quantum mechanics in atomic physics
- the importance of electron spin, symmetric and antisymmetric wave functions and vector atom model
- Effect of magnetic field on atoms and its application
- Learn Molecular physics and its applications.

- This course will be useful to get an insight into spectroscopy.

Unit - I		(15 lect.)
1. Hydrogen atom: Schrödinger's equation for Hydrogen atom, Separation of variables, Quantum Numbers: Total quantum number, Orbital quantum number, Magnetic quantum number. Angular momentum, Electron probability density (Radial part). 2. Electron spin: The Stern-Gerlach experiment, Pauli's Exclusion Principle Symmetric and Anti-symmetric wave functions. Ref – Unit – I - B: 9.1 to 9.9, B: 10.1, 10.3. 2		
Unit -II		(15 lect.)
1. Spin orbit coupling, Total angular momentum, Vector atom model, L-S and j-j coupling. Origin of spectral lines, Selection rules. 2. Effect of Magnetic field on atoms, the normal Zeeman effect and its explanation (Classical and Quantum), The Lande g - factor, Anomalous Zeeman effect. Ref – Unit – II - B: 10.2, 10.6, 10.7, 10.8, 10.9. B : 11.1 and 11.2		
Unit -III		(15 lect.)
1. 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. 2. Infrared spectrometer & Microwave spectrometer . Ref – Unit – III - B: 14.1, 14.3, 14.5, 14.7		

Unit -IV		(15 lect.)

1. Raman effect: Quantum Theory of Raman effect, Pure Rotational Raman spectra: Linear molecules, symmetric top molecules, Asymmetric top molecules, Vibrational Raman spectra: Raman activity of vibrations, Experimental set up of Raman Effect.
2. Electron spin resonance: Introduction, Principle of ESR, ESR spectrometer

3. Nuclear magnetic resonance: Introduction, principle and NMR instrumentation.

Ref – Unit – IV - 1. BM: 6.11, 6.1.3. 2.

BM: 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.3.1. GA: 8.6.1

2. GA: 11.1,11.2and 11.3

3. GA: 10.1,10.2,10.3

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 Aruldhas (2nd Ed) PHI learning Pvt Ltd.
4.	Atomic Physics (Modern Physics): S.N.Ghoshal. S.Chand Publication (for problems on atomic Physics).