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 - USPH504: Electrodynamics

Learning outcomes:

On successful completion of this course students will be able to:

1) Understand the laws of electrodynamics and be able to perform calculations using them.
2) Understand Maxwell's electrodynamics and its relation to relativity
3) Understand how optical laws can be derived from electromagnetic principles.
4) Develop quantitative problem solving skills.

UNIT I

Electrostatics

1. Review of Coulomb & Gauss law, The divergence of **E**, Applications of 'Gauss' law, The curl of **E**. Introduction to potential, Comments on potential, The potential of a localized charge distribution. Poisson's equation and Laplace's equation. Solution and properties of 1D Laplace equation. Properties of 2D and 3D Laplace equation (without proof).

2. Boundary conditions and Uniqueness theorems, Conductors and Second Uniqueness theorem, The classic image problem- point charge and grounded infinite conducting plane and conducting sphere.

DG: 2.1.1 to 2.1.3, 2.2.2 to 2.2.4, 2.3.1 to 2.3.4
DG: 3.1.1 to 3.1.4, 3.1.5, 3.1.6, 3.2.1 to 3.2.4

Unit -II	**Electrostatics in Matter and Magnetostatics**	(15 lect.)

1. Dielectrics, Induced Dipoles, Alignment of polar molecules, Polarization, Bound charges and their physical interpretation, Gauss' law in presence of dielectrics, A deceptive parallel, Susceptibility, Permittivity, Dielectric constant and relation between them, Energy in dielectric systems.

2. Review of Biot-Savart's law and Ampere's law, Straight-line currents, The Divergence and Curl of **B**, Applications of Ampere's Law in the case of a long straight wire and a long solenoid, Comparison of Magnetostatics and Electrostatics, Magnetic Vector Potential.

DG: 4.1.1 to 4.1.4, 4.2.1, 4.2.2, 4.3.1, 4.3.2, 4.4.1, 4.4.3
DG: 5.2.1, 5.3.1 to 5.3.4, 5.4.1

Unit -III	**Magnetostatics in Matter and Electrodynamics**	(15 lect.)

1. Magnetization, Bound currents and their physical interpretation, Ampere's law in magnetized materials, A deceptive parallel, Magnetic susceptibility and permeability.

2. Energy in magnetic fields, Electrodynamics before Maxwell, Maxwell's correction to Ampere's law, Maxwell's equations, Magnetic charge, Maxwell's equations in matter, Boundary conditions.

DG: 6.1.1, 6.1.4, 6.2.1, 6.2.2, 6.2.3, 6.3.1, 6.3.2, 6.4.1
DG: 7.2.4, 7.3.1 to 7.3.6

Unit -IV	**Electromagnetic Waves**	(15 lect.)

1. The continuity equation, Poynting's theorem

2. The wave equation for **E** and **B**, Monochromatic Plane waves, Energy and momentum in electromagnetic waves, Propagation in linear media, Reflection and transmission of EM waves at normal incidence, Reflection and transmission of EM waves at oblique incidence.

DG : 8.1.1, 8.1.2
DG : 9.2.1 to 9.2.3, 9.3.1 to 9.3.3

References	
1.	DG: Introduction to Electrodynamics, David J. Griffiths (3rd Ed) Prentice Hall of India.
Additional References	
1.	Introduction to Electrodynamics: A. Z. Capria and P. V. Panat, Narosa Publishing House.
2.	Engineering Electrodynamics: William Hayt Jr. & John H. Buck (TMH).
3.	Foundations of Electromagnetic Theory: Reitz, Milford and Christy.
4.	Solutions to Introduction to Electrodynamics: David J. Griffiths (3rd Ed) Prentice Hall of India.