ST. XAVIER'S COLLEGE (AUTONOMOUS), AHMEDABAD-9
FACULTY OF SCIENCE

DEPARTMENT OF PHYSICS & ELECTRONICS

SEMESTER – II

SYLLABUS

OF

BSc PHYSICS (HONOURS)

BASED ON UNDERGRADUATE CURRICULUM FRAMEWORK
(NEP – 2020)

(Effective from Academic Year 2023)

Curriculum Framework for Semester – II

Course	Title	Content		Credit
DSC-3 (Theory)	PHMC221C Electromagnetics and Electronics	U1	Electrostatics	4
		U2	Magnetostatics	
		U3	Electric and Electronic Circuits	
		U4	Bipolar Junction Transistor	
DSC-4 (Laboratory)	PHMC222L Physics and Experiential Lab-II	14 Physics Experiments		4
		Experiential Lab: 1 hands on experiment.		
Minor-1 (Theory + Lab)	PHMN221C Basic Physics-II	U1	Electrostatics	2
		U2	Bipolar Junction Transistor	
		U3 U4	14 experiments as mentioned in syllabus	2
Minor-1 (Theory + Lab)	ELMN221C Basic Electronics-II	U1	Network theorem and Filters	2
		U2	General Amplifier Characteristics	
		U3 U4	14 experiments as mentioned in syllabus	2
SEC	PHSE221C Physics Analysis Using C Programming	U1	• C Language Programming-I • C Language Programming-II	2
		U2	Laboratory Component	
MDC	MDC 206C Astronomy for Beginners	U1	Intr. to Astronomy and Observations in Astronomy	4
		U2	Principles and Tools for Observations in Astronomy	
		U3	Celestial Objects and Their Nature	
		U4	Field Trip/Project/Stargazing	
AEC	Ability Enhancement Course	(To be offered by the concerned subject Department)		2
VAC	Value Added Course	(To be chosen from a basket of courses)		2
Total Credits				**22**

* DSC: Discipline Specific Core

St. Xavier’s College (Autonomous), Ahmedabad

Syllabus of Semester–II to be implemented from the Academic Year **2025-26.**

DEPARTMENT OF PHYSICS & ELECTRONICS

Minor Course: Basic Physics-II

Course Code & Title	**Credit Distribution of The Course**				**Eligibility Criteria**	**Prerequisite(s) of the Course (if any)**
	Cr	Lecture hrs	Tutorial hrs	Activity/Case study analysis		
PHMN221C: Basic Physics-II	4	12x4	3x4		10 + 2 from a recognized board	Science Stream Math-Group

Learning Objectives:

LO1	Apply Gauss’s Law, divergence, curl, and potential concepts to solve electrostatic problems, and calculate energy in point and continuous charge distributions.
LO2	Analyze transistor configurations and biasing, use the Ebers-Moll model, and apply AC bridge techniques (Maxwell, Schering, Wien) for impedance measurements.

Course Outcomes:

CO1	Understand and apply electrostatic principles including electric field, potential, energy, boundary conditions, and behavior of conductors and capacitors.
CO2	Analyze the operation and applications of Bipolar Junction Transistors (BJTs) and AC bridge circuits used for precise electrical measurements.

Unit 1: Electrostatics

Credit of Course: 1 Cr **Lecture 12 Hrs** **Tutorial 3Hrs**

Divergence and Curl of Electrostatic fields: Field lines, flux, and Gauss's Law, The Divergence of E, Applications of Gauss's Law, The Curl of E, Electric Potential: Introduction to potential, comments on potential, Poisson's equation and Laplace's Equation, The potential of a localized charge distribution, Summary: Electrostatics boundary conditions, Work and Energy in Electrostatics: The work done to move a charge, The energy of a point charge distribution, The energy of a continuous charge distribution, Comments on electrostatics Energy, Conductors: Basic Properties, Induced Charges, Surface charges and the force on a conductor, Capacitors

Text Book:

- Introduction to Electrodynamics: Third Edition **David J Griffiths.** 2.2, 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.3, 2.3.1, 2.3.2, 2.3.3, 2.3.4, 2.3.5, 2.4, 2.4.1, 2.4.2, 2.4.3, 2.4.4 2.5, 2.5.1, 2.5.2, 2.5.3, 2.5.4.

References Books:

- Electromagnetism, **B.B. Laud**.

Unit 2: BJT and AC Bridges

Credit of Course: 1 Cr **Lecture 12 Hrs** **Tutorial 3Hrs**

A. **Bipolar Junction Transistor:** Introduction, Construction, Transistor Biasing, Operation of NPN Transistor, Operation of PNP, Transistor, Types of Configuration, Transistor as an Amplifier, Large signal, d.c. and Small Signal, CE values of Current Gain, Breakdown in Transistors, Ebser-Moll Model
B. **AC Bridges:** Condition for bridge balance, Maxwell bridge, Schering bridge, Wein bridge

Text Book:

- Electronic devices and circuits, **Salivanhanan and N. Suresh Kumar,** 6.1, 6.10
- Electronic Instrumentation, **Helfrick Cooper**

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Syllabus of Semester–V to be implemented from the Academic Year **2025-26.**

DEPARTMENT OF PHYSICS & ELECTRONICS

Minor Course: Basic Physics II

Course Code & Title	Credit Distribution of The Course			Eligibility Criteria	Prerequisite(s) of the Course (if any)
	Cr	Laboratory Hrs per week	Activity/Case study analysis		
PHMN221C: **Basic Physics-II**	2	4		10 + 2 from a recognized board	Science Stream Math-Group

Learning Objectives:

LO1	Learn the physical principles underlying thermal radiation, oscillations, magnetism, optics, electronics, and mechanics.
LO2	Acquire hands-on experience in using laboratory instruments like the vibration magnetometer, transformer, rectifier circuits, and flywheel.
LO3	Practice accurate data collection, analysis using methods such as least squares fitting, and error estimation techniques.
LO4	Investigate mechanical and electrical resonance phenomena (Melde's experiment, series resonance) and their practical significance.
LO5	Examine I–V characteristics of p–n junction diodes and understand concepts of rectification and load line analysis

Course Outcomes:

CO1	Demonstrate the ability to perform experiments based on mechanics, optics, and thermal physics (e.g., simple pendulum, moment of inertia, Stefan's constant).
CO2	Analyze and interpret experimental results to extract physical parameters like capacitance, resonant frequency, and diode characteristics
CO3	Apply the method of least squares and error analysis to validate experimental data and assess its reliability.
CO4	Operate and troubleshoot basic electronic components such as diodes, transformers, and rectifiers in circuit configurations.
CO5	Correlate theoretical concepts with experimental outcomes and communicate scientific findings effectively in written and oral formats.

B.Sc. (PHYSICS) SEMESTER -II PHMN221C (Practical)

01	Newton’s Ring
02	Cauchy’s Constants
03	Radioactive decay
04	Deflection Magnetometer
05	Projection Method
06	Owen’s Bridge
07	FET Characteristics
08	Parallel Resonance
09	Full wave Rectifier
10	‘g’ by Bar Pendulum
11	Universal Logic Gate: AND, OR, NOT, NAND & NOR
12	Decay Constant
13	Value of Inductance
14	Numerical Study of SHM