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

DEPARTMENT OF PHYSICS & ELECTRONICS

SEMESTER – IV

SYLLABUS

OF

BSc PHYSICS (HONOURS)

BASED ON UNDERGRADUATE CURRICULUM FRAMEWORK (NEP – 2020)

(Effective from Academic Year 2023)

Curriculum Framework for Semester – IV

Course	Title	Content		Credit
DSC-8 (Theory)	PHMC441C Modern Physics and Nuclear Physics	U1	Modern Physics	4
		U2	Special Relativity	
		U3	Nuclear Physics	
		U4	Nuclear Physics: Instrumentation	
DSC-9 (Theory)	PHMC442C Electromagnetism and Thermal Physics	U1	Magnetic Field in Matter	4
		U2	Electric Field in Matter	
		U3	Kinetic Theory and Thermoelectricity	
		U4	Thermodynamics	
DSC-10 (Laboratory)	PHMC443L Physics and Experiential Lab-IV	14 Physics Experiments		4
		Experiential Lab		
Minor-1 (Theory + Lab)	PHMN441C Basic Physics-III	U1	Electric Field in Matter	2
		U2	Kinetic Theory and Thermoelectricity	
		U3 U4	14 Physics Experiments	2
Minor-1 (Theory + Lab)	ELMN441C Basic Electronics-III	U1	Voltage Regulators	2
		U2	Impedance Transformer and Coupled Circuits	
		U3 U4	14 Experiments	2
SEC	PHSE441C Arduino (Swayam)	U1	Arduino	2
		U2	Laboratory Component	
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–IV to be implemented from the Academic Year **2025-26.**

DEPARTMENT OF PHYSICS & ELECTRONICS

Minor Course: Basic Electronics – III

Course Code & Title	Credit Distribution of The Course				Eligibility Criteria	Prerequisite(s) of the Course (if any)
	Cr	Lecture + Tutorials hrs	Laboratory Hrs per week	Activity/Case study analysis		
ELMN441C: Basic Electronics – III	4	12x2 + 3x2	4		10 + 2 from a recognized board	Science Stream Math-Group

Learning Objectives:

LO1	Explain the working principles of Zener diode and transistor-based regulators, and calculate component values such as the current limiting resistor for effective voltage regulation.
LO2	Understand and apply concepts of mutual inductance, coupling coefficient, and impedance matching using T and L section networks in high-frequency applications.
LO3	Understand the working principles and characteristics of basic analog electronic components and circuits, including amplifiers, oscillators, and voltage regulators.
LO4	Develop circuit analysis and design skills by constructing and testing active and passive electronic circuits, and interpreting their behavior using measuring instruments like CRO.

Course Outcomes:

CO1	Understand and analyze different voltage regulation techniques using Zener diodes, transistors, and IC voltage regulators, including their configurations, advantages, and limitations.
CO2	Demonstrate knowledge of impedance transformation techniques and analyze various resonant and transformer-based circuits, including coupled and tuned circuits.
CO3	Demonstrate the ability to design, build, and analyze analog circuits such as amplifiers, oscillators, and voltage regulators using transistors.
CO4	Use laboratory instruments effectively (e.g., CRO) to measure and evaluate circuit performance, including phase, frequency, and signal characteristics.

Unit 1: Voltage Regulators

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

Voltage regulation, zener diode shunt regulator, working of zener diode shunt regulator, optimum value of current limiting resistor, disadvantage of zener diode shunt regulator, transistor shunt regulator, transistor series regulator, controlled transistor series regulator, short circuit protection against overload, transistor current regulator.

IC voltage Regulator: 3-terminal positive voltage regulators, 3-terminal negative voltage regulators, 3 and 4 terminal adjustable voltage regulators, 4 terminal positive voltage regulators, 4 terminal negative voltage regulators. Current Regulator ICs

Text Book:

- A Text Book of Electronic Circuits by R. S. Sedha – Articles 34.1 – 34.13

Unit 2: Impedance Transformers and Coupled Circuits

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

Transformation impedance with tapped resonant circuits, Reactance L sections for impedance transformation, Image impedance, reactance matching, Reactance T networks for impedance transformation, coupled circuits, mutual inductance, coefficient of coupling equivalent T network for magnetically coupled circuit, Iron-core transformer, the Ideal transformer, singly tuned air-core transformer, doubly tuned air core transformer.

Text Book

- Networks, Lines and Fields by J. D. Ryder – Articles 3.1 – 3.12

Unit 3 & 4: List of Practical

S. No.	Experiment
1	To study CE amplifier (frequency response).
2	To study CC amplifier (frequency response).
3	To study CB amplifier (frequency response).
4	To study CE amplifier (load variation).
5	Wein bridge oscillator using transistor.
6	To design and construct constant current regulator using a transistor.
7	To design and construct the shunt voltage regulator.
8	To design and construct the electronic voltage regulator.
9	Constant K-type low pass and high pass filters.
10	Phase measurement using CRO and unknown frequency.
11	RC phase shift oscillator using transistor.
12	Voltage Regulator using IC 7805, 7810, 7815