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

DEPARTMENT OF PHYSICS & ELECTRONICS

SEMESTER – I

SYLLABUS

OF

BSc ELECTRONICS (HONOURS)

BASED ON UNDERGRADUATE CURRICULUM FRAMEWORK
(NEP – 2020)

(Effective from Academic Year 2023)

Curriculum Framework for Semester – I

Course	Title	Content		Credit
DSC-1	ELMC111C Fundamental of Electronics-I	U1	Number Systems and Codes	4
		U2	Boolean Algebra	
		U3	Diodes and their Applications	
		U4	General Amplifier Characteristics	
DSC-2	ELMC112L Electronics and Experiential Lab-I	14 Experiments		4
		Experiential Lab: Hands on experiment.		
Minor	ELMN111C Basic Electronics-I	U1	Number Systems and Codes	4
		U2	Diodes and their Applications	
		U3	14 Experiments	
		U4		
MDC	MDC 260C How Things Works	U1	Basics of Electricity and Household Electric Systems	4
		U2	Common Electronic Gadgets and How They Work	
		U3	Mechanical Appliances and Simple Machines	
		U4	Laboratory	
SEC	ELSE11C Electronics Design using C Programming	U1	C Language Programming	2
		U2	Electronics Designing Using C Programming	
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–I to be implemented from the Academic Year **2025-26.**

DEPARTMENT OF PHYSICS & ELECTRONICS

Major Course: Fundamental of Electronics-I

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		
ELMC111C Fundamental of Electronics-I	4	12x4	3x4		10 + 2 from a recognized board	Science Stream

Learning Objectives:

LO1	Understand various number systems and binary codes, perform interconversions, and apply binary arithmetic including error detection and correction techniques.
LO2	Learn Boolean laws, simplification methods such as Karnaugh Map and Quine-McCluskey, and design basic combinational circuits like adders and subtractors.
LO3	Understand the behavior and applications of diodes in various clipping, clamping, and voltage multiplier circuits, and explore the operation of special-purpose diodes.
LO4	Analyze amplifier characteristics such as input/output resistance, decibel gain, harmonic distortion, and bandwidth using theoretical and practical methods.

Course Outcomes:

CO1	Students will be able to analyze and implement number system conversions, binary arithmetic operations, and apply error detection and correction codes like Hamming Code in digital systems.
CO2	Students will be able to simplify complex Boolean expressions and design efficient combinational logic circuits using standard logic design techniques.
CO3	Students will be able to analyze diode-based circuits and explain the operation and practical applications of special-purpose diodes like LEDs, photodiodes, and LASER diodes.
CO4	Understand the principles of amplification and evaluate amplifier performance based on gain, distortion, efficiency, and frequency response.

Unit 1: Number Systems and Codes

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

Introduction, number system, inter conversion of number, signed binary number, floating point representation of number, binary arithmetic, complement binary arithmetic, arithmetic overflow, codes (BCD, 2-4-2-1 code, 4-bit BCD and 5-bit BCD, Biquinary code, excess 3, grey code, 7-segment code, alpha numeric codes, error detecting, error correcting code, hamming code.

Textbook:
Digital electronics By G. K. Kharate
Publication: Oxford University Press
Article: 2.1 to 2.9

Unit 2: Boolean Algebra

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

Basic Laws of Boolean algebra, over view of logic circuit, DE Morgan's theorem, standard representation for Logical function, MINTERM and MAXTERM, Simplification of Boolean expression, Karnaugh Map simplification, simplification of SUM OF PRODUCT, Simplification of PODUCT OF SUM, don't care condition, Quine-McCluskey method, Design procedure for combinational Logic circuit, Half Adder, Full adder, N bit parallel adder, Subtractor, N bit parallel subtractor.

Textbook:
Digital electronics By G. K. Kharate
Publication: Oxford University Press
Article: 3.1 to 3.12, 4.1 to 4.4

Unit 3: Diodes and their Applications

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

Load line analysis of a diode circuit, clipping circuit, positive and negative clipper, biased clipper clipper, some other biased clipper, combination clipper, two level slicer, clamping circuit, biased clampers, practical clamper circuits, application of clamping circuits, voltage multiplier, voltage doublers, voltage Tripler and quadrupler.
Special purpose diodes: varactor diode, varactor diode specifications and applications, LED, LED voltage drop and current, LED applications, multicolour LEDs, LCDs, photodiodes, photoconductive cells, photo voltaic cells, LASER diodes and applications.

Textbook:
Electronic Devices and Circuits by Allen Mottershead
Publication: PHI
Article: 2.1
A textbook of electronic circuits R. S. Sedha
Publication: S. Chand
Article: 6.1 to 6.14., 7.12 to 7.14, 7.21 to 7.24, 7.27 to 7.31, 7.33 to 7.35-7.25

Unit 4: General Amplifier Characteristics

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

Concept of amplification, amplifier notation, current, voltage and power gain, amplifier input resistance and output resistance, maximum power transfer, conversion efficiency, classes of amplifier, harmonic distortion, three-point method of calculating distortion, Measurement of harmonic distortion, other type of amplifier distortion Decibels, other equation for decibel computation, zero decibel reference level, use of a voltmeter as a decibel indicator, voltmeter range correction factor, frequency response, amplifier band width, phase relationship in amplifier, square wave testing.

Textbook:
Electronic Devices and Circuits by Allen Mottershead
Publication: PHI
Article: 7.1 to 7.12, 7.15, 7.16, 8.1 to 8.5, 8.7, 8.8, 8.10, 8.11

Reference Books:

- Digital Fundamentals by Floyd and Pearson
- Digital Design by Moris and Mano
- Digital Principles by Malvino and Leach, McGraw Hill Publication
- Electronic Devices and Circuit By Boylestead and Namensky.Electronic Principles By Malvino and Bates

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DEPARTMENT OF PHYSICS & ELECTRONICS

Major Course: Electronics and Experiential Lab-I

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		
ELMC112L Electronics and Experiential Lab-I	4	8		10 + 2 from a recognized board	Science Stream

LEARNING OBJECTIVES (LO)
(Electronics Laboratory)

LO1	To enable students to test active and passive electronic components and operate standard laboratory instruments such as CROs, multimeters, and power supplies for analyzing analog circuits like rectifiers, voltage multipliers, LED setups, clipping/clamping circuits, and Wien bridge oscillators.
LO2	To enable students to construct digital logic circuits and perform code conversions (Binary ↔ Gray) using diode and IC-based circuits, and to verify their correct operation through practical experimentation.

(Experiential Lab.)

LO1	To enable students to identify real-world problems and apply scientific principles in designing and developing functional prototypes or experimental models.
LO2	To enable students to test and evaluate their models, analyze performance data, and effectively communicate their findings through structured reports and demonstrations.

Course Outcomes (CO)
(Electronics Laboratory)

CO 1	Identify and test basic electronic components and effectively use standard laboratory instruments to implement and analyze analog circuits such as rectifiers (with and without filters) and special electronic devices.
CO 2	Design, implement, and verify digital logic circuits and code converters, and evaluate their performance for various applications.

(Experiential Lab.)

CO 1	Students will be able to conceive, plan, and implement a scientific model or circuit based on a selected concept in physics or electronics, integrating creativity with technical knowledge.
CO 2	Students will be able to demonstrate and present their working model, effectively communicating the underlying principles, execution process, and potential applications, while evaluating the challenges faced during development.

B.Sc. (ELECTRONICS) SEMESTER -I ELMC112L (Practical)

01	Identification and testing of electronic active and passive components.
02	To familiarize with various laboratory instruments.
03	To study load characteristics, internal resistance and ripple factors of a half wave rectifier (with and without “C” filter).
04	Study of AND, OR, NOT, NOR, NAND and EX-OR gates using IC7400.
05	To Convert grey to Binary and Binary to grey using diode clamping.
06	Clamping Using Diode.
07	BCD to seven segments.
08	To determine dielectric constant of given material.
09	To study voltage doubler circuit.
10	To study voltage multiplier circuit.
11	I-V Characteristics of different colored LED.
12	To study load characteristics, internal resistance and ripple factor of a full wave rectifier.
13	Clipping using diode.
14	To study Wein bridge as a frequency selective network.