

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



DEPARTMENT OF PHYSICS & ELECTRONICS

SEMESTER – II

**SYLLABUS
OF
BSc ELECTRONICS (HONOURS)**

**BASED ON UNDERGRADUATE CURRICULUM FRAMEWORK
(NEP – 2020)**

(Effective from Academic Year 2023)

Curriculum Framework for Semester – II

Course	Title	Content		Credit
DSC-1	ELMC221C Fundamental of Electronics-II	U1	Network Theorem and Resonance Circuit	4
		U2	Impedance Transformation and Coupled Circuits	
		U3	Bipolar junction Transistor	
		U4	Mid Band Analysis of small signal Amplifier	
DSC-2	ELMC222L Electronics and Experiential Lab-II	14 Experiments		4
		Experiential Laboratory		
Minor	ELMN221C Basic Electronics-II	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	ELSE221C Electronics Circuits and Testing	U1		2
		U2	Laboratory Component	
AEC	Ability Enhancement Course	* (To be offered by the concerned subject Department) Ability Enhancement Course		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

Major Course: Fundamental of Electronics-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		
ELMC221C Fundamental of Electronics-II	4	12x4	3x4		10 + 2 from a recognized board	Science Stream

Learning Objectives:

LO1	Students will be able to apply various network theorems (Thevenin, Norton, superposition, maximum power transfer, etc.) to simplify complex electrical circuits and analyze resonance conditions.
LO2	Students will be able to explain impedance transformation techniques and analyze coupled circuits using mutual inductance and transformer models.
LO3	Students will be able to describe the operation of NPN/PNP transistors, biasing methods, and the factors affecting transistor stability.
LO4	Students will be able to use two-port network models (Z, Y, h, and re) to analyze BJT amplifiers in the mid-frequency range.

Course Outcomes:

CO1	On successful completion, students will demonstrate the ability to analyze and design series and parallel resonant circuits, and apply network theorems for efficient circuit reduction and performance evaluation.
CO2	On successful completion, students will design impedance-matching networks and evaluate performance characteristics of coupled and transformer-based circuits.
CO3	On successful completion, students will apply biasing techniques to design stable transistor circuits and analyze their performance under different operating conditions.
CO4	On successful completion, students will design and analyze single-stage RC coupled transistor amplifiers using hybrid models and apply Miller's theorem for circuit simplification

Unit 1: Network Theorem and Resonance Circuit

Credit of Course: 1 Cr

Lecture 12 Hrs

Tutorial 3Hrs

Network Theorem: Reduction of complicated network, conversion between T and π sections, bridge T network, the lattice network, superposition theorem, the reciprocity theorem, Thevenin's theorem, Norton theorem, maximum power transfer theorem, compensation theorem.

Resonance: Definition of Q, the figure of merit, series resonance, Bandwidth of the series resonant circuit, parallel resonance or anti resonance, current in anti-resonant circuits, Bandwidth of anti-resonant.

Textbook: Networks, Lines and fields by John D. Ryder

Publication: PHI

Article: 1.4 to 1.13, 2.1 to 2.4, 2.6, 2.8

Unit 2: Impedance Transformation 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.

Textbook: Networks, Lines and fields by John D. Ryder

Publication: PHI

Article: 3.1 to 3.11

Unit 3: Bipolar junction Transistor

Credit of Course: 1 Cr

Lecture 12 Hrs

Tutorial 3Hrs

Operation of NPN transistor, Operation of PNP transistor, CE configuration, Break down in Transistor, EBSE-MOLL model, Bias stability, Thermal run away, Stability factor, Method of Transistor Biasing, Fixed Bias method, Emitter feedback bias, collector to Base bias, collector emitter feedback bias, Voltage divider bias, Bias compensation, Thermistor and bias compensation.

Textbook: Electronic Devices and Circuits by S. Salivahanan and N. Suresh Kumar

Publication: McGrawHill

Article: 6.4, 6.5, 6.6, 6.9 to 6.13

Unit 4: Mid Band Analysis of small signal Amplifier

Credit of Course: 1 Cr

Lecture 12 Hrs

Tutorial 3Hrs

Two port devices and Network Parameters, Z, Y and h parameters, Hybrid model for two port network, Analysis of transistor amplifier circuits using h parameters, Simplified CE hybrid model, The 're' model of transistor, small signal analysis of single stage BJT amplifier, CE amplifier with unbypassed emitter resistance, CE amplifier with voltage divider bias, MILLER's theorem and its dual, Design of single stage RC coupled amplifier using BJT.

Textbook: Electronic Devices and Circuits by S. Salivahanan and N. Suresh Kumar

Publication: McGrawHill

Article: 9.2, 9.3, 9.4, 9.9, 9.12, 9.14, 9.15

Reference Books:

- Electronic Devices and Circuit by Boylestead and Namensky. Electronic Principles By Malvino and Bates
- Electronic Devices and Circuits by Allen Mottershead

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DEPARTMENT OF PHYSICS & ELECTRONICS

Major Course: Electronics and Experiential Lab-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		
ELMC221L Electronics and Experiential Lab-II	4	8		10 + 2 from a recognized board	Science Stream

Learning Objectives (LO) (Electronics Laboratory)

LO1	Verify Thevenin's, Superposition, and Maximum Power Transfer theorems through practical circuits.
LO2	Record and interpret input-output characteristics of BJT in common base, emitter, and collector configurations.
LO3	Design and test RC high-pass, low-pass, and band-pass filters to study their behaviour.
LO4	Construct EX-OR based logic circuits and study applications such as parity checking and signal inversion.

(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)

CO1	Understand and apply fundamental network theorems in electrical circuits.
CO2	Analyze the characteristics and configurations of bipolar junction transistors (BJT).
CO3	Design and evaluate passive filter circuits and their frequency response.
CO4	Implement and examine the working of logic gates and optoelectronic devices

(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 -II ELMC221L (Practical)

1	To verify the Thevenin's theorem.
2	To verify the maximum power transfer theorem.
3	To verify the superposition theorem.
4	Conversion of given network into T-network and π -network.
5	Common base transistor input and output characteristics.
6	Common emitter transistor input and output characteristics.
7	Common collector input and output characteristics.
8	RC high pass filters.
9	RC low pass filters.
10	(Band pass filter) To design and verify Band pass filter.
11	Study of two, three and four input EX-OR gate, EX-OR gate as a parity checker and inverter
12	To study load characteristics and ripple factor of bridge rectifiers.
13	IV characteristics of a photodiode.
14	Project.