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

DEPARTMENT OF PHYSICS & ELECTRONICS

SEMESTER – III

SYLLABUS

OF

BSc ELECTRONICS (HONOURS)

BASED ON UNDERGRADUATE CURRICULUM FRAMEWORK (NEP – 2020)

(Effective from Academic Year 2023)

Curriculum Framework for Semester – III

Course	Title	Content		Credit
DSC-5 (Theory)	ELMC331C Basic Analog Electronics-I	U1	Frequency Response of Amplifiers & Multi stage Amplifiers	4
		U2	Negative Feedback in transistor amplifier	
		U3	Field Effect transistor and MOSFET	
		U4	Transistor Oscillators	
DSC-6 (Theory)	ELMC332C Basic Digital Electronics and Microprocessors	U1	Flip-Flops and Shift Registers	4
		U2	Data processing circuits, Clock and 555 timer	
		U3	Microprocessor-I	
		U4	Microprocessor-II	
DSC-7 (Laboratory)	ELMC333L Electronics and Experiential Lab-III	14 Electronics Experiments		4
		Experiential Lab: Hands on experiment.		
SEC	ELSE331C Arduino (SWAYAM)	U1	Arduino	2
		U2	Laboratory Component	
MDC	MDC260C How Things Work	U1	Electric and home appliances	4
		U2	Light and Communication appliances	
		U3	Mechanical Appliances and Simple Machines	
		U4	Solar cell and sensor-based appliances	
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–III to be implemented from the Academic Year **2025-26.**

DEPARTMENT OF PHYSICS & ELECTRONICS

Major Course: Basic Analog 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		
ELMC331C Basic Analog Electronics-I	4	12 × 4	3 × 4		10 + 2 from a recognized board	Science Stream Math-Group

Learning Objectives:

LO1	Understand and analyze the frequency response of single and multistage transistor amplifiers.
LO2	Understand the theory and applications of negative feedback in transistor amplifiers, including types of feedback configurations, and the working and biasing of Darlington amplifier
LO3	Explain the Construction, operation, Characteristics and amplifier applications of JFETS and MOSFETS.
LO4	Understand the principles, operation, and frequency stability of transistor oscillators, including LC, RC, and crystal oscillators such as Hartley, Colpitts, Wien bridge, and phase shift oscillators.

Course Outcomes:

CO1	Provide fundamental knowledge of frequency behavior and coupling methods used in transistor amplifiers.
CO2	Analyze and design transistor amplifier circuits using various negative feedback techniques and implement Darlington configurations to improve amplifier performance.
CO3	Provide basic understanding of FET and MOSFET devices for electronic Circuit applications.
CO4	Able to analyze and design transistor oscillator circuits using different configurations and evaluate their frequency stability and performance.

Unit 1: Frequency Response of Amplifiers & Multistage Amplifiers

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

[A] Frequency Response of Amplifiers: General shape of frequency response of amplifier, General frequency consideration, Low frequency response of transistor amplifier, Effect of Bypass capacitor on low frequency response, Effect of coupling capacitor on low frequency response, High frequency π model for a transistor, Hybrid π capacitances, CE short circuit current gain, β cut off frequency, α cut off frequency, High frequency current gain with resistive load

[B] Multistage Amplifiers: Different coupling scheme used in amplifier, Two stage RC coupled amplifier, Transformer coupled amplifier.

Text Book:

Electronic Devices and Circuits (3rd edition) by S Salivahanan, Suresh kumar McGraw Hill Publication

[A] Article no: 11.4, 11.5, 11.7-11.9

[B] Article no: 10.2, 10.5, 10.6

Reference Books:

Electronic Devices and Circuits by J.B.Gupta, Katson educational series

Textbook of Electronic Circuits by R S Sedha, S. Chand & Co.

Electronic devices and circuits: An introduction by Allen Mottershead, PHI

Unit 2: Negative Feedback in transistor amplifier

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

Negative Feedback in transistor amplifier: General theory of feedback, reasons for negative feedback, loop gain, types of negative feedback in transistor circuits , Current series feedback, Voltage series feedback, Voltage shunt feedback, The Darlington connection, Biasing the Darlington amplifier.

Text Book

Electronic devices and circuits: An introduction by Allen Mottershead, PHI

Article No: 17.1 to 17.7

Reference Books:

Electronic Devices and Circuits by J.B.Gupta, Katson educational series

Electronics Devices and Circuit (3rd edition) by S Salivahanan, Suresh kumar McGraw Hill Publication

Textbook of Electronic Circuits by R S Sedha, S. Chand & Co.

Unit 3: Field Effect Transistor & MOSFET

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

[A] Field Effect Transistor: Introduction, Advantages and disadvantages of FET, Basic construction of JFET, Characteristic curve of the JFET, Principle of operation of JFET, Effect of V_{ds} on channel conductivity, Channel ohmic region and pinch off region, Characteristic parameters of the JFET, Effect of temperature on FET parameters, Common source amplifier.

[B] MOSFET: The depletion MOSFET, The enhancement MOSFET, difference between JFET's and MOSFET's, handling precautions for MOSFETS, Dual gate MOSFETS, Integral gate protection, Testing field effect transistor, applications of FETS in its channel ohmic region, application of FET as a VVR in voltage control attenuator, The field effect diode

Text Book

Electronic devices and circuits: An introduction by Allen Mottershead, PHI

[A] Article No: 21.1 to 21.9

[B] Article No: 22.1 to 22.7

Reference Books:

Electronics Devices and Circuit (3rd edition) by S Salivahanan, Suresh kumar McGraw Hill Publication

Textbook of Electronic Circuits by R S Sedha, S. Chand & Co.

Unit 4: Transistor Oscillators

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

Transistor Oscillators: Introduction, Operation of Oscillator, Essential of transistor oscillator, Frequency stability of oscillator, Types of transistor oscillator, LC oscillator, Tuned collector oscillator, Colpitts's oscillator, Hartley oscillator, Crystal oscillator, RC phase shift oscillator(using transistor), Wien bridge oscillator

Text Book:

Electronic Devices and Circuits by J.B.Gupta, Katson educational series
Article No: 20.1 to 20.7, 20.11, 20.13, 20.14, 20.16, 20.17

Reference Books:

Electronic devices and circuits: An introduction by Allen Mottershead, PHI
Electronics Devices and Circuit (3rd edition) by S Salivahanan, Suresh kumar McGraw Hill Publication
Textbook of Electronic Circuits by R S Sedha, S. Chand & Co.

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

DEPARTMENT OF PHYSICS & ELECTRONICS

Major Course: Basic Digital Electronics and Microprocessors						
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		
ELMC332C Basic Digital Electronics and Microprocessors	4	12 × 4	3 × 4		10 + 2 from a recognized board	Science Stream Math-Group

Learning Objectives:

LO1	Understand and analyze the working principles, types, and timing characteristics of flip-flops and shift registers used in sequential circuits.
LO2	Understand and apply data processing circuits and 555 timer operations for digital signal generation and control
LO3	Understand microprocessor architecture, instruction set, and interfacing with memory and logic devices
LO4	Explain the 8085 microprocessor architecture, bus timing, and memory interfacing Concepts

Course Outcomes:

CO1	Design and analyze basic sequential circuits using flip-flops and shift registers for digital system applications.
CO2	Provide basic knowledge of digital circuits and timers for signal processing and timing application.
CO3	Provide basic knowledge of microprocessor Systems and their operations for Computer applications
CO4	Enable understanding of 8085-based microcomputer and practical memory interfacing methods

Unit 1: Flip-Flops and Shift Registers

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

[A] Flip - Flops: RS Flip-Flops, Gated Flip-Flops, Edge-triggered RS Flip-Flops, Edge-triggered JK Flip-Flops, Flip-Flop timing, JK master slave flip-flops, Various representation of flip-flops, Analysis of sequential circuits, Conversion of Flip-flops.

[B] Shift Registers: Types of Registers, serial– in- serial out, serial in-parallel out, parallel in serial out, parallel in parallel out, Application of Shift Registers.

Textbook:

Digital Principles and Applications; 6th Edition By Leach, Malvino and Saha, TMH

[A] Article No: 8.1 to 8.3, 8.5, 8.6, 8.7, 8.9, 8.10, 8.11

[B] Article No: 9.1 to 9.6

Reference Books:

Digital Fundamentals by Floyd, Pearson

Digital design Morris and Mano, PHI

Unit 2: Data Processing Circuits & Clock 555 Timer

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

[A] Data processing circuits: Multiplexers, Demultiplexers, 1-of-16 decoder, BCD-to-decimal decoders, seven segment decoders, encoders, Priority encoder, Exclusive-OR gate, parity generators and checkers, read only memory.

[B] Clock and 555 Timer: Description of functional diagram, monostable operation, linear ramp generator, frequency divider, astable operation. Clock waveforms, TTL clock, Schmitt Trigger, Monostables with input logic, Pulse Forming Circuit.

Textbook:

Digital Principles and applications 6th edition Malvino Leach and Saha, TMH

[A] Article No: 4.1 to 4.8, 4.10

Linear Integrated Circuits 4th edition by Chaudhary and Jain, New Age International Publishers.

[B] Article No: 8.1 to 8.4

Digital principles and applications by Malvino, leach and saha 6th edition, TMH

[B] Article No: 7.1 to7.3, 7.6, 7.7

Reference Books:

Digital Fundamentals by Floyd, Pearson

Digital design Morris and Mano, PHI

Unit 3: Microprocessor I :Microprocessor Architecture and Microcomputer Systems

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

Microprocessor - I: Microprocessor, Instruction set and computer language, Microprocessor Architecture and Microcomputer Systems: Microprocessor Architecture and its operations, Memory, Logic devices for interfacing.

Textbook:

Microprocessor Architecture, Programming, and Applications with the 8085

Article No: 1.1, 1.2, 3.1, 3.2, 3.5

Unit 4: Microprocessor – II :8085 Microprocessor Architecture and memory Interfacing

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

Microprocessor – II: 8085 Microprocessor Architecture and memory Interfacing: The 8085 MPU: The 8085 Microprocessor, Microprocessor communication and Bus timings, De multiplexing the Bus AD7-AD0, Generating Control Signals, A Detailed look at the8085 MPU and its Architecture, Decoding and Executing an Instruction Example of an 8085 based microcomputer: Opcode Fetch Machine Cycle, Memory Read Machine Cycle, How to recognize Machine Cycle, Memory interfacing: Memory Structure and Its Requirements, Basic Concepts In Memory Interfacing, Address Decoding, Interfacing Circuit, Address Decoding and Memory Addresses.

Textbook:

Microprocessor Architecture, Programming, and Applications with the 8085

Article No: 4.1, 4.2, 4.3

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DEPARTMENT OF PHYSICS & ELECTRONICS

Major Course: Electronics and Experiential Lab-III

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		
ELMC333L: Electronics and Experiential Lab-III	4	8		10 + 2 from a recognized board	Science Stream Math-Group

LEARNING OBJECTIVES (LO)
(Electronic Laboratory)

LO1	Understand and analyze the working of analog electronic circuits including amplifiers, oscillators, and feedback circuits.
LO2	Design and implement combinational digital logic circuits using logic ICs and Karnaugh map simplification.
LO3	Develop and execute basic microprocessor programs for arithmetic and logical operations.

(Experiential Lab.)

LO1	Independently identify the aim of a basic experiment with a creative or modified twist.
LO2	Collaboratively understand the problem and set up the complete experiment through self-learning in a team of 2–3 students
LO3	Analyse potential sources of error and assess their impact on the results.

Course Outcomes (CO)
(Physics Laboratory)

CO 1	Design and test analog circuits such as RC coupled amplifiers, FET amplifiers, oscillators, and feedback amplifiers.
CO 2	Construct and verify digital circuits using ICs like IC 7483, IC 7486, IC 74151, IC 74155, and IC 74138.
CO 3	Write and debug microprocessor programs for performing arithmetic, logical, and control operations.

(Experiential Lab.)

CO 1	Set up and demonstrate new experiments to verify assigned physics principles and measure physical quantities.
CO 2	Independently calculate errors in measured results.
CO 3	Present and submit the experiment in the form of a scientific report.

B.Sc. (PHYSICS) SEMESTER -III PHMC333L (Practical)

01	Two Stage RC Coupled Amplifier.
02	Common Source FET Amplifier.
03	To obtain the static and transfer characteristic of N channel depletion type MOSFET Amplifier
04	Study of 8:1 multiplexer (74151) and study of 1:4 and 1:8 demultiplexer using IC 74155 and designing combinational circuits.
05	Study of 3:8 decoder and BCD to Decimal decoder (74138 and 7475) and designing combinational circuits.
06	Design of logic circuit using Karnaugh map (sop method).
07	RS Flip-flop, JK Flip-flop, T Flip-flop and D Flip-flop
08	Conversion of one flip-flop into another.
09	Hartley Oscillator and Colpitts's Oscillator using transistor.
10	Voltage series negative feedback Amplifier.
11	Current series feedback Amplifier.
12	Microprocessor programming I
13	Microprocessor programming II
14	Microprocessor programming III