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CURRICULUM FOR PRINCIPLES OF ELECTRONIC COMMUNICATION

Document Number: PBoS-2425-APR-23301-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	05/04/2024	PRINCIPLES OF ELECTRONIC COMMUNICATION	SG &VN	VRR	SBG

EXECUTIVE SUMMARY

Principles of electronic communication provides a foundational understanding of analog communication systems, focusing on how information is transmitted, processed, and received through various modulation and propagation techniques. It equips students with both theoretical knowledge and practical insights into modern communication technologies.

The subject begins with the **basics of communication systems**, introducing the block diagram of a communication system and the need for modulation. It covers different types of modulation— **Amplitude Modulation (AM) Frequency Modulation (FM), and Phase Modulation (PM)— along** with transmission modes such as simplex, half-duplex, and full-duplex. A major portion of the course is dedicated to **Amplitude Modulation (AM)**, where students learn its mathematical representation, modulation index, bandwidth requirements, and power calculations. It also includes different types of AM (DSB, SSB), methods of generation, and **demodulation techniques** such as diode detectors.

Concepts like automatic gain control and the working of a **super heterodyne receiver** are also covered, along with key performance parameters like sensitivity, selectivity, and fidelity. The course further explores **Frequency Modulation (FM)**, including its mathematical analysis, bandwidth considerations, and generation techniques (direct and indirect methods). Students study FM receiver operation and demodulation methods such as ratio detectors and PLL, along with a comparison of FM and AM performance.

In the second section, the focus shifts to **wave propagation**, explaining how electromagnetic waves travel through different media. Topics include reflection, refraction, diffraction, polarization, and propagation modes such as ground wave, sky wave, and space wave. Important parameters like critical frequency, skip distance, and fading are also discussed.

The subject also covers **antenna theory**, including radiation mechanisms, antenna types, and performance parameters such as gain, efficiency, and bandwidth. Practical antenna designs like dipole, monopole, Yagi-Uda, horn, and microstrip patch antennas are introduced. Finally, the course introduces **pulse analog modulation**, focusing on sampling theory, aliasing, and different sampling techniques used in signal processing.

Overall, this subject prepares students to understand and analyze communication systems, enabling them to work with modulation techniques, signal transmission, antennas, and wave propagation in real-world applications such as radio, television, and wireless communication systems.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Mrs. Surbhi Gaoshinde	Subject Expert	
2	Mr. Vinay Nagalikar	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering															
Course Code	Course Title	PRINCIPLES OF ELECTRONIC COMMUNICATION												Course Type	Semester	
23301														DSC	3	
Learning Scheme						Assessment Scheme										
Actual Contact Hrs./Week			SLH	NLH	CREDITS	THEORY				PRACTICAL				SLA		Total
						FA	SA	Total		FA		SA				
CL	TL	LL						Max	Min	Max	Min	Max	Min	Max	Min	
3	---	2	1	6	3	30	70	100	40	25	10	50	20	25	10	200

1) IKS of 2 hrs.
2) Theory paper duration 3 hrs.
3) Theory paper assessment is Internal and External.
4) The assessment of Practical is Internal and External.
5) Formative Assessment out of 30 marks is average of 2 periodical tests (PT).
6) The assessment of Self Learning is Internal.

RATIONALE:

This subject comes under the Core Technology group and will enable the students to comprehend the theory ,concepts ,characteristics and working principles of basic electronic communication techniques and their applications in communication circuits. Concepts such as modulation, side band transmission, radiation and propagation, reception and demodulation which are widely used in the field of analog communication are dealt with in this subject. Knowledge of basic electronic devices and circuits is a prerequisite for the learning of this subject.

COURSE OUTCOMES::-- The student will be able to

Semester	3	Subject	Principles of Electronic Communication
CO 301		1st Course In Semester Three	
CO 301.1		**Understand the need & fundamentals of Various Modulation and Demodulation techniques.**	
CO 301.2		**Analyze the operation of AM & FM transmitter and receiver.**	
CO 301.3		**Express the role of different types of Wave Propagation in communication circuits.**	
CO 301.4		**Recognize & Describe the construction, principle of operation of various types of Antennas and their uses in communication.**	
CO 301.5		**Identify & Describe the fundamentals of different types of Pulse communication.**	

Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM III	Principles of Electronic Communication								
CO 301	1st Course In Semester Three								
CO 301	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 301.1	3	2	1	2	2	1	2	2	1
CO 301.2	3	3	2	3	2	1	2	2	1
CO 301.3	2	3	3	2	3	1	2	3	1
CO 301.4	3	3	3	3	2	1	2	2	1
CO 301.5	2	3	2	3	3	1	2	3	1
CO TOTAL	16	17	13	15	15	6	12	12	5
CORRELATION LEVEL	3	3	2	3	3	1	2	2	1

TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	0,1,2	3,4,5,6,7,8	9,10,11,12, 13,14	15,16,17,18
CORELATION LEVEL	0	1	2	3

	Section--1						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
1	**MODULATION**						
1.1 1.2 1.3 1.4	Block Diagram of Basic Communication system Definition, need for modulation. Types of modulation - AM, FM &PM. Types of transmission modes –Simplex, half duplex and full duplex (only definition)	04	03	06	---	09	**CO 301.1**
2	**AMPLITUDE MODULATION & DEMODULATION**						
2.1 2.2 2.3 2.4 2.5 2.6	Mathematical representation of Amplitude modulated wave, Modulation Index, Band width requirement, Representation of AM signal in Time and Frequency domain. AM transmission Power, current calculations. Numerical on above topics. Types of AM(DSB, SSB), Generation of AM. Demodulation of AM signal: Diode detector and practical diode detector. Automatic gain control and its types. Super heterodyne receiver block diagram. Specifications of radio receivers: Sensitivity, Selectivity, Fidelity.	10	04	06	03	13	**CO 301.2 CO 301.3**
3	**FREQUENCY MODULATION & DEMODULATION**						
3.1 3.2 3.3 3.4	Frequency Modulation: representation of FM signal in time domain and frequency domain , frequency deviation ratio, modulation index(δ), mathematical representation of FM, bandwidth requirement, types of frequency modulation (NB and WBFM). Generation of FM using direct (varactor diode and reactance modulator) and indirect method (Armstrong method) Block diagram of FM receiver and its working with waveforms. FM detector circuits: Ratio detector and PLL as FM demodulator Advantages & disadvantages of FM over AM.	10	04	06	03	13	**CO 301.2 CO 301.3**

	Section--2						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
4	**WAVE PROPAGATION**						
4.1 4.1.1 4.1.2 4.1.3 4.1.4 4.2 4.3	Fundamentals of electromagnetic wave. Electromagnetic Spectrum & Band Designation. Reflection, refraction, diffraction & polarization. Rectangular waveguide modes- TE,TM modes, field patterns. Propagation of waves through Rectangular waveguide. Groundwave propagation Sky wave propagation Ionosphere. Concept of actual height and virtual height. Definition:- critical frequency, max-usable frequency, skip distance, fading, Space wave propagation, Duct propagation, Tropospheric scatter.	10	04	07	04	15	**CO 301.3**
5	**ANTENNA**						
5.1 5.2 5.3 5.4 5.4.1 5.4.2 5.4.3 5.4.4 5.4.5 5.4.6 5.4.7	Radiation Mechanism. Types of Antennas Resonant and non- resonant antenna Grounded and ungrounded antenna. Definitions: - Isotropic antenna, Directive gain, Power gain, Antenna resistance, Antenna Efficiency, Beam- width, Bandwidth, Effective radiated power. Antennas:-Construction, Working principles and Radiation pattern. Monopole antenna. Dipole Antenna-Half wave dipole. Dish antenna. Yagi-uda antenna. Pyramidal Horn antenna. Helical antenna. Micro-strip patch antenna.	10	04	06	02	12	**CO 301.2** **CO 301.4**
6	**PULSE ANALOG MODULATION**						
6.1 6.2	Ideal sampling, Sampling theorem, aliasing, interpolation, Natural and flat top sampling in time and frequency domains	04	04	04	---	08	**CO 301.2** **CO 301.5**

IMPLEMENTATION STRATEGY:

1) Use of Power Point presentations and Videos.
2) References from the internet **(for teachers as well as students).**
3) Extensive use of examples.
4) Group discussions and microproject.
5) Assignments for writing skills, create awareness about selection circuits, devices.

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME	CHAPT. NO.
1.	Amplitude Modulation Using DSB –TC and SC modulator.	CO 301.1 , CO 301.2	1
2.	FM Modulator.	CO 301.1 , CO 301.2	1
3.	Voltage Analysis of Single Band AM Radio Receiver.	CO 301.1 , CO 301.2	1
4.	Voltage Analysis of FM Radio Receiver.	CO 301.1 , CO 301.2	1
5.	DSB – TC Demodulator.	CO 301.1 , CO 301.2	1
6.	DSB - SC Demodulator.	CO 301.1 , CO 301.2	3
7.	SSB - SC Demodulator.	CO 301.1 , CO 301.2	2
8.	Measure and plot Selectivity of AM Receiver.	CO 301.1 , CO 301.2	3
9.	Measure and plot Sensitivity of AM Receiver.	CO 301.1 , CO 301.2	3
10.	Measure and plot Fidelity of AM Receiver.	CO 301.1 , CO 301.2	2
11.	Measurement of Bandwidth of Horn Antenna.	CO 301.1 , CO 301.3	5
12.	Measurement of Attenuation of Horn Antenna.	CO 301.1 , CO 301.3	5

Fault finding practical's are demo experiments which is an extra skill imparted in the laboratory and not covered in theory.

IMPLEMENTATION STRATEGY

1. Practical plan
2. Minimum 10practicals must be performed

The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 25') of the defined expected course outcomes is as shown in the format given below:
(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C301.2 (out of 25)	C301.2 (out of 25)	C301.2 (out of 25)	C301.3 (out of 25)	C301.3 (out of 25)	C301.3 (out of 25)
STUDENT SPNO							
2303001							
2303002							
2303004							

- The final % attainment level for TERM WORK of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.

SUGGESTED LIST OF MICROPROJECTS :::

Microproject could be group based. A suggestive list is given here, similar microprojects could be added by concern faculty. Each student will maintain dated work diary with details of individual contribution. Assessment done by project guide based on their performance , presentation of microproject.

SR. NO.	TITLE
1	Prepare a poster to show different types of radio communications.
2	Build a circuit for Amplitude modulation using IC MC 1496 / 8038.
3	Prepare model or chart of types of radio communications.
4	Build a circuit for Frequency modulation using IC 8038 / BF 549.
5	Build circuit of tunning IFT at 455khz.
6	Design a given Antenna.

SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
Section I						
1	**Modulation**	04	03	06	---	09
2	**Amplitude Modulation & Demodulation**	10	04	06	03	13
3	**Frequency Modulation & Demodulation**	10	04	06	03	13
Section II						
4	**Wave Propagation**	10	04	07	04	15
5	**Antenna**	10	04	06	02	12
6	**Pulse Analog Modulation**	04	04	04	---	08
Total		**48**	**23**	**35**	**12**	**70**
Legends::R::--Remember, U::--Understand, A::--Application						
This specification table provide guide line to teacher to teach & assess student also a general guideline to frame theory paper & practical theory exam paper which student have to undertake. The actual distribution of marks at different taxonomy level in the question paper may vary from above table.						

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	Wayne Tomasi	Elec. Comm. Systems	2nd	1989	Pearson Education
2.	George Kenedy	Electronic communication systems	2nd	1993	McGraw-Hill
3.	Dennis Roddy & John Coolen	Electronic Communication	2nd	1988	Prentice Hall of India Pvt. Ltd
4.	Gary M. Miller	Modern Electronic Communication	3rd	1994	Prentice Hall of India Pvt. Ltd

E REFERENCES ::--

- https://en.wikipedia.org/wiki/Modulation
- https://en.wikipedia.org/wiki/Amplitude_modulation
- https://en.wikipedia.org/wiki/Frequency_modulation
- https://en.wikipedia.org/wiki/Radio_receiver
- https://econtent.msbte.edu.in/econtent/econtent_home.php

ST. XAVIER'S TECHNICAL INSTITUTE

To Nurture the Joy of Excellence in the World of High Technology

CURRICULUM FOR DIGITAL ELECTRONICS

Document Number: PBoS-2425-APR-23302-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	05/04/2024	DIGITAL ELECTRONICS	RVG / JN	VRR	SBG

EXECUTIVE SUMMARY

The Curriculum of the course *Digital Electronics (23302)* comes under the Core Technology group and enables students to understand the theory, concepts, characteristics, and working principles of digital electronic components and circuits. Digital Electronics plays a vital role in modern electronics and communication systems, forming the foundation for digital devices and computing systems.

This subject focuses on imparting fundamental concepts, principles, and applications of digital circuits, including logic gates, Boolean algebra, number systems, combinational and sequential circuits, flip-flops, counters, and memory devices. It also emphasizes the design and analysis of digital systems used in real-world applications. Knowledge of basic electronic devices and circuits is a prerequisite for this course.

The course curriculum begins with need analysis by incorporating inputs from key stakeholders such as industry experts, employers, alumni, faculty, and parents. This ensures that the curriculum remains relevant, industry-oriented, and aligned with current technological advancements.

Based on the identified needs, the course content is structured in accordance with national standards such as AICTE and MSBTE guidelines, along with the principles of NEP 2020. The curriculum integrates theory, practical sessions, and microprojects to promote experiential and application-based learning.

The course content emphasizes understanding of logic design, simplification techniques, arithmetic circuits, sequential logic circuits, and digital system design. Assessment methods are designed to evaluate learning outcomes through continuous assessment and practical performance.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Mr. R. V. Gheware	Subject Expert	
2	Dr. Janani Natarajan	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering															
Course Code	Course Title	DIGITAL ELECTRONICS												Course Type	Semester	
23302														DSC	3	
Learning Scheme						Assessment Scheme										
Actual Contact Hrs./Week			SLH	NLH	CREDITS	THEORY				PRACTICAL				SLA		Total
								Total		FA		SA				
CL	TL	LL				FA	SA	Max	Min	Max	Min	Max	Min	Max	Min	
3	—	2	1	6	3	30	70	100	40	25	10	50	20	25	10	200

1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of Practical is Internal and External.
4) Formative Assessment out of 30 marks is average of 2 periodical tests (PT).
5) The assessment of Self Learning is Internal.

RATIONALE:

This subject comes under the Core Technology group and will enable the students to comprehend the theory, concepts, characteristics and working principles of digital electronics components, techniques and their applications in electronics & communication circuits. Concepts such as gates, flipflops, counters which are widely used in the field of digital electronics & communication area are dealt with in this subject. Knowledge of basic electronics, electronic devices and circuits is a prerequisite for the learning of this subject..

COURSE OUTCOMES ::-- The student will be able to

Semester	3	Subject	Digital Electronics
CO 302		2nd Course In Semester Three	
CO 302.1		**Use Boolean laws and Karnaugh Map to simplify complex logical expressions.**	
CO 302.2		**Compare different number systems and illustrate different code converters.**	
CO 302.3		**Illustrate different types of arithmetic circuits.**	
CO 302.4		**Illustrate different types of flip-flops.**	
CO 302.5		**Design counters and shift registers.**	
CO 302.6		**Design and test data converters, semiconductor memories.**	

Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM III	Digital Electronics								
CO 302	2nd Course In Semester Three								
CO 302	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 302.1	3	3	3	2	2	1	2	2	2
CO 302.2	3	3	2	1	2	1	2	3	2
CO 302.3	3	3	3	2	1	2	2	3	2
CO 302.4	3	3	3	2	1	1	2	2	2
CO 302.5	3	3	3	2	1	1	2	3	2
CO 302.6	3	3	3	2	1	1	2	1	1
CO TOTAL	18	18	17	11	08	07	12	14	11
CORRELATION LEVEL	3	3	3	2	1	1	2	2	2

TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

	Section -- 1						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
1	**LOGIC GATES AND LOGIC FAMILIES**						
1.1	AND, OR, NOT NAND, NOR, EX-OR and EXNOR gates Logical expression and truth-tables.	06	03	04	02	09	**CO 302.1**
1.2	Digital logic Families: Bipolar, Unipolar , TTL - different types, TTL NAND Gate and Inverter Parameters VIH, VIL, VOH, VOL IIH, IIL, IOH, IOL, Propagation Delay Time, Power Dissipation, Noise margin, Noise Immunity.						
1.3	Boolean Algebra:						
1.3.1	AND laws, OR laws, Commutative law, Associative Law, Distributive law, Absorption law.						
1.3.2	De-Morgan's Theorems.						
1.3.3	Simple examples of Boolean Algebra.						
1.3.4	Sum of the Product and Product of the Sum forms of Boolean Expressions.						
1.3.5	Writing Truth table from Logical Expression and to write Logical Expression from the Truth Table.						
1.3.6	Drawing Logical circuit diagram from Logical Expression.						
1.4	Karnaugh Map, Drawing K-map for a given function, truth table.						
2	**NUMBER SYSTEMS AND CODES**						
2.1	Decimal, Binary, Octal, Hexadecimal system.	09	04	06	03	13	**CO 302.2**
2.1.1	Conversion of a number from one number system to the other system.						
2.2	Binary Codes:						
2.2.1	Weighted codes 8421.						
2.2.2	Error Detecting code- Even/odd parity code.						
2.3	Code converters:						
2.3.1	Gray to Binary.						
2.3.2	Binary to Gray.						
2.3.3	BCD to Decimal.						
2.3.4	Decimal to BCD.						
2.3.5	BCD to seven segment decoder.						

	Section -- 1						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
3	**COMBINATIONAL CIRCUITS**						
3.1 3.2 3.3 3.4 3.5 3.6	Half Adder using logical gates -Logical circuit diagram, Expressions of outputs and working. Full Adder- using logical gates, using Half Adders, Logical circuit diagram, Expressions of outputs and working. Half subtractor using logical gates, Logical Circuit diagram, Expressions of outputs and working. Full subtractor using logical gates, Logical circuit diagram, Expressions of outputs and working. Addition, Subtraction of binary numbers – 1's & 2's complement, 4 Bit Binary Parallel Adder, 4 Bit Binary Parallel Adder/Subtractor. Multiplexer – 2:1, 4:1, 8:1. Demultiplexer – 1:2, 1:4, 1:8.	09	03	06	04	13	**CO 302.3**

	Section -- 2						
Chapter No.	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
4	**SEQUENTIAL LOGIC CIRCUITS**						
4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.7.1 4.7.2 4.7.3 4.7.4 4.7.5 4.7.6 4.7.7 4.7.8	R-S Flip-flop using NAND gates, NOR gates, Truth-table, Race-round condition. Clocked RS Flip-flop- Level triggering, Edge triggering (using NAND gates). Clocked D Flip-flop using NAND gates, Preset and Clear inputs. JK FF using R-S FF its truth table. Master and slave JKFF, Advantage-over simple JKFF, Preset & clear inputs. Shift Registers: Logic diagram of 4- bit Shift registers – SISO, PISO, SIPO, PIPO, 4 Bit Universal Shift register. Counters: Asynchronous (ripple) binary counter. Synchronous (parallel) binary counter. Design of the above using flip-flops and comparison. Comparison between Asynchronous and Synchronous counters. Up/Down ripple counter. Decade counter using RESET input. Ring counter. Mod counters design.	18	05	12	05	22	**CO 302.4 CO 302.5**
5	**DATA CONVERTERS AND SEMICONDUCTOR MEMORIES**						
5.1 5.2 5.3	DAC: Types, weighted resistor circuit and R- 2R ladder circuit, DAC IC 0808 specifications. ADC: Block Diagram, types, and working of Dual slope ADC, SAR ADC, ADC IC 0808/0809, specification. Memory: RAM and ROM basic building blocks, read and write operation , types of semiconductor memories.	06	04	06	03	13	**CO 302.6**

IMPLEMENTATION STRATEGY:

1) Use of PowerPoint presentations and Videos.
2) References from the internet **(for teachers as well as students).**
3) Extensive use of examples.
4) Group discussions and micro project.
5) Assignments for writing skills, create awareness about selection /purchasing components.

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME	CHAPT. NO.
1.	NAND Gate as an Universal Gate.	**C 302.1**	**1**
2.	Half Adder and Full Adder.	**C 302.3**	**3**
3.	Four Bit Binary Parallel Adder.	**C 302.3**	**3**
4.	RS Flip-flop.	**C 302.4**	**4**
5.	D Flip-flop.	**C 302.4**	**4**
6.	JK Flip-flop.	**C 302.4**	**4**
7.	BCD to Decimal Decoder.	**C 302.2**	**2**
8.	Four Bit Binary Controlled Inverter.	**C 302.3**	**3**
9.	Decade / BCD Counter using IC 7490.	**C 302.5**	**5**
10.	Operation and Characteristics of a Shift Register.	**C 302.5**	**5**
11.	Left Shift and Right Shift operation with Shift Register.	**C 302.5**	**5**
12.	Arithmetic Operations with Shift Register.	**C 302.5**	**5**
13.	Ripple Counter.	**C 302.5**	**5**
14.	Reverse Counter.	**C 302.5**	**5**
15.	Programmable Counter.	**C 302.5**	**5**
16.	Modulo 9 Counter.	**C 302.5**	**5**
17.	BCD to 7 Segment Decoder / Driver for LED Display.	**C 302.2**	**2**
18.	Constructing a Clock Oscillator.	**C 302.6**	**6**

Fault finding practicals are demo experiments which is an extra skill imparted in the laboratory and not covered in theory.

IMPLEMENTATION STRATEGY

1. Teaching plan
2. Minimum 10 practicals

The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 25') of the defined expected course outcomes is as shown in the format given below:
(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		**1**	**2**	**3**	**4**	**5**	**6**
	COURSE OUTCOMES	**C302.2 (out of 25)**	**C302.2 (out of 25)**	**C302.2 (out of 25)**	**C302.3 (out of 25)**	**C302.3 (out of 25)**	**C302.3 (out of 25)**
STUDENT SPNO							
2303001							
2303002							
2303004							

- The final % attainment level for TERM WORK of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.

SUGGESTED LIST OF MICROPROJECTS

Micro project could be group based. A suggestive list is given here, similar micro projects could be added by concerned faculty. Each student will maintain dated work diary with details of individual contribution. Assessment is done by project guide based on their performance and presentation of microproject submission.

SR. NO.	TITLE
1.	Build a Digital IC tester circuit. Build a circuit to test 7 segment displays.
2.	Build a circuit to implement debounce switch.
3.	Build a 4bit parity generator and parity checker circuit.
4.	Build a circuit to implement 4 bit adder.
5.	Build a circuit for LED flasher.
6.	Build a circuit for LED BAR display.
7.	Design and analyze digital arithmetic circuit.

SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
	Section I					
1.	**Logic Gates and Logic Families**	06	03	04	02	09
2.	**Number System**	09	04	06	03	13
3.	**Combinational Logic Circuits**	09	03	06	04	13
	Section II					
4.	**Sequential Logic Circuit**	18	05	12	05	22
5.	**Data Converters and Semiconductor Memories**	06	04	06	03	13
	Total	**48**	**19**	**34**	**17**	**70**
Legends :: R ::-- Remember , U ::-- Understand , A ::--Application						
This specification table provide guide line to teacher to teach &assess student also a general guideline to frame theory paper & practical theory exam paper which student have to undertake. The actual distribution of marks at different taxonomy level in the question paper may vary from above table.						

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	R. P. Jain	Modern Digital Electronics	4th	1986	Tata McGraw Hill
2.	Malvino & Leach	Digital Principles & Applications	4th	1986	Tata McGraw Hill
3.	William Gothman	Digital Electronics	2nd	1998	Prentice Hall of India
4.	Salivahanan S. Arivazhagan S.	Digital Circuits and Design Digital Electronics	4th	2013	Vikas Publishing House, New Delhi
5.	Digital Electronics	Puri, V.K.	2nd	2016	McGraw Hill, New Delhi.

E REFERENCES ::--

- https://www.tutorialspoint.com/digital_circuits/index.htm
- https://tutorialsinhand.com/tutorials/digital-electronics-tutorial/
- https://www.youtube.com
- http://vlabs.iitb.ac.in/vlabs-dev/labs/digital-electronics/
- https://www.mathsisfun.com/binary-digits.html
- https://econtent.msbte.edu.in/econtent/econtent_home.php

ST. XAVIER'S TECHNICAL INSTITUTE

To Nurture the Joy of Excellence in the World of High Technology

CURRICULUM FOR LINEAR INTEGRATED CIRCUITS

Document Number: PBoS-2425-APR-23303-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	05/04/2024	LINEAR INTEGRATED CIRCUITS	VN	VRR	SBG

EXECUTIVE SUMMARY

The Curriculum of the course **Linear Integrated Circuits** (23303) comes under the Core Technology group and will enable the students to comprehend the theory, concepts, characteristics and working principles of basic electronic circuits. Linear Integrated Circuits hold an important unique place in the field of electronics. This subject is classified under the Basic Technology group with a focus on imparting concepts, principles and applications of Linear/Analog integrated circuits in the field of Electronics. The prerequisite for this subject is knowledge of basic electronic devices and circuits.

The Course curriculum begins with **need analysis**, incorporating inputs from key stakeholders such as industry experts, employers, alumni, faculty, and parents. This ensures that the curriculum remains relevant, future-oriented, and responsive to societal and economic demands.

Based on the identified needs, course contents are defined and are in alignment with national standards such as AICTE, MSBTE guidelines and the principles of NEP 2020. A structured curriculum is then developed, with appropriate integration of Theory and Practicals along with Microprojects.

The Course contents emphasize **on understanding core concepts of OPAMP and build amplifier circuits** Assessment mechanisms are designed to measure outcome attainment through continuous evaluation.

Overall, the course helps students to understand core concepts of amplifiers along with building and testing them.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Mr. Vinaykumar S. Nagalikar	Subject Expert	
2	Dr. Shivaji Ghungrad	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering															
Course Code	Course Title	LINEAR INTEGRATED CIRCUITS												Course Type	Semester	
23303														DSC	3	
Learning Scheme						Assessment Scheme										
Actual Contact Hrs./Week			SLH	NLH	CREDITS	THEORY				PRACTICAL				SLA		Total
						FA	SA	Total		FA		SA				
CL	TL	LL						Max	Min	Max	Min	Max	Min	Max	Min	
3	---	2	1	6	3	30	70	100	40	25	10	50	20	25	10	200

1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of Practical is Internal and External.
4) The Online Practical assessment is Internal.
5) Formative Assessment out of 30 marks is average of 2 periodical tests (PT).
6) The assessment of Self Learning is Internal.

RATIONALE:

This subject comes under the Core Technology group and will enable the students to comprehend the theory, concepts, characteristics and working principles of basic electronic circuits. Linear Integrated Circuits hold an important unique place in the field of electronics. This subject is classified under Basic Technology group with a focus on imparting concepts, principles and applications of Linear/Analog integrated circuits in the field of Electronics. The prerequisite for this subject is knowledge of basic electronic devices and circuits.

COURSE OUTCOMES ::-- The student will be able to

Semester	3	Subject	Linear Integrated Circuits
CO 303		3rd Course In Semester Three	
CO 303.1		**Analyze working of Op –Amp in Mathematical operations.**	
CO 303.2		**Analyze working of Op –Amp in linear and non-linear applications.**	
CO 303.3		**Demonstrate working principle of PLL and Develop electronics circuits using PLL.**	
CO 303.4		**Apply the knowledge of Voltage regulators in designing power supply.**	
CO 303.5		**Illustrate electronics circuits using timer IC555.**	

Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM III	Linear Integrated Circuits								
CO 303	3rd Course In Semester Three								
CO 303	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 303.1	3	-	1	-	-	2	-	-	-
CO 303.2	1	-	1	1	1	1	1	-	-
CO 303.3	2	-	1	1	-	1	-	-	-
CO 303.4	3	2	3	2	1	3	1	-	-
CO 303.5	3	1	3	2	1	2	2	-	-
CO TOTAL	12	03	09	06	03	09	04	-	--
CORRELATION LEVEL	2	1	2	1	1	2	1	0	0

TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

	Section -- 1						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
1	**OP - AMPS**						
1.1 1.2 1.3 1.4	Block diagram study of an op-amp. Parameters of op amp:- 741- Ideal parameters, definitions- Input offset voltage, Input offset current, Input Bias current, CMRR,PSRR, Slew Rate, Output voltage swing, Gain- Bandwidth product. Op amp as a linear amplifier: - open & closed loop configurations, Virtual Ground Concept, Offset null adjustment, Transfer Characteristic. Inverting, Non-inverting & differential configurations - Expressions of voltage Gain, Input resistance, output resistance &bandwidth for each. Applications of inverting & non- inverting amplifiers as summing, scaling and averaging amplifier. (i) Log and Antilog amplifier. (ii) Integrator and differentiator. Voltage Follower, Instrumentation Amplifier using 3 op amps - having fixed gain and variable gain.	14	04	10	03	17	**CO 303.1**
2	**TYPICAL OPAMP CIRCUITS**						
2.1 2.2 2.3	OPAMP Sine Wave (L.F.) Oscillators: Operating principle, circuit, operation and applications of Wien Bridge and Phase Shift Oscillator. OPAMP Active Filters: (Simple Treatment) Low-Pass and High-Pass type First Order and Second Order Butterworth active filters. Comparison with passive filters. Advantages of employing the OPAMP in Active Filters. Inverting and Non-Inverting Comparator, Zero crossing detector, Peak detector, Schmitt trigger V-I converter and I-V Converter, Sample and Hold circuit.	10	04	10	04	18	**CO 303.2 CO 303.1**

	Section -- 2						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
3	**PHASE LOCKED LOOP (PLL)**						
3.1 3.2 3.3 3.4	Block diagram of VCO IC LM-566. Working principle, functional block diagram and operation of PLL system. The PLL parameters - Lock-range, capture range, the transfer characteristics Block diagram study of PLL I.C. type 565. Applications of PLL - F.M. Demodulator Frequency Multiplier.	06	03	04	03	10	**CO 303.3**
4	**LINEAR AND SWITCHING VOLTAGE REGULATORS**						
4.1 4.2 4.3 4.4	Concepts of Voltage Regulation: Line, Load, Temperature stability, Ripple rejection. The 3-Pin voltage Regulators: Structure and Operation, Advantage and limitations. The 78xx and 79xx I.C.s and their power supply circuits, the LM-317 I.C. Regulator and its power supply circuit. Block diagram of switching voltage regulator. Block diagram of an SMPS power Supply System, employing Controller I.C. type SG-3524.	09	04	06	03	13	**CO 303.4**
5	**TIMER I.C. TYPE NE-555**						
5.1 5.2 5.3 5.4	Functional block diagram study and operation. Operation in Monostable Mode. Operation in Astable Mode. Application as square wave generator.	09	03	06	03	12	**CO 303.2** **CO 303.4**

IMPLEMENTATION STRATEGY:

1) Use of PowerPoint presentations and Videos.
2) References from the internet **(for teachers as well as students).**
3) Extensive use of examples.
4) Group discussions and micro project.
5) Assignments for writing skills, create awareness about selection /purchasing components.

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME	CHAPT. NO.
1.	Inverting Amplifier.	**C303.1**	1
2.	Non Inverting Amplifier.	**C303.1**	1
3.	Differential Amplifier.	**C303.1**	1
4.	Integrator.	**C303.1**	1
5.	Differentiator.	**C303.1**	1
6.	Low Pass Filter.	**C303.2**	2
7.	High Pass Filter.	**C303.2**	2
8.	Monostable Multivibrator (Using IC-555).	**C303.5**	5
9.	Astable MultiVibrator (Using IC- 741).	**C303.5**	5
10.	Astable MultiVibrator (Using IC-555).	**C303.5**	5
11.	7805 and 7905 Voltage regulator.	**C303.4**	4
12.	317 Voltage regulator.	**C303.4**	4
13.	Wien Bridge Oscillator.	**C303.2**	2
14.	Schmitt Trigger.	**C303.2**	2
15.	PLL 565 Parameters.	**C303.3**	3

* Fault finding practicals are demo experiments which is an extra skill imparted in the laboratory and not covered in theory.

IMPLEMENTATION STRATEGY

1. Teaching plan
2. Minimum 10 practicals

The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 25') of the defined expected course outcomes is as shown in the format given below:
(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		**1**	**2**	**3**	**4**	**5**	**6**
	COURSE OUTCOMES	**C303.2 (out of 25)**	**C303.2 (out of 25)**	**C303.2 (out of 25)**	**C303.3 (out of 25)**	**C303.3 (out of 25)**	**C303.3 (out of 25)**
STUDENT SPNO							
2303001							
2303002							
2303004							

* The final % attainment level for TERM WORK of each course outcome may then becomputed and the overall % attainment level for the course, for term work may then be calculated.

SUGGESTED LIST OF MICROPROJECTS

Micro project could be group based. A suggestive list is given here, similar micro projects could be added by concern faculty. Each student will maintain dated work diary with details of individual contribution. Assessment done by project guide based on their performance, presentation of submission.

SR. NO.	TITLE
1.	Build a Wave generator.
2.	Build a Regulated power supply.
3.	Build a Square wave circuit.
4.	Build a circuit to implement 4 bit adder.
5.	Build a circuit for LED flasher.

SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
	Section I					
1.	**OP - AMPS**	14	04	10	03	17
2.	**Typical OPAMP Circuits**	10	04	10	04	18
	Section II					
3.	**Phase Locked Loop (PLL)**	06	03	04	03	10
4.	**Linear And Switching Voltage Regulators**	09	04	06	03	13
5.	**Timer I.C. Type NE-555**	09	03	06	03	12
	Total	**48**	**18**	**36**	**16**	**70**

Legends :: R ::-- Remember , U ::-- Understand , A ::--Application

This specification table provide guide line to teacher to teach &assess student also a general guideline to frame theory paper & practical theory exam paper which student have to undertake. The actual distribution of marks at different taxonomy level in the question paper may vary from above table.

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	R. Gaikwad.	Operational Amplifiers	4th	1983	Prentice Hall
2.	J. Michael Jacob	Applications and Design with Analog Integrated Circuits	2nd	1993	Prentice Hall
3.	K. R. Botkar	Integrated Circuits	3rd	1994	Khanna Publishers

E REFERENCES ::--

- https://www.tutorialspoint.com/analog_circuits/index.htm
- https://tutorialsinhand.com/tutorials/analog-electronics-tutorial/
- https://www.youtube.com
- http://vlabs.iitb.ac.in/vlabs-dev/labs
- https://econtent.msbte.edu.in/econtent/econtent_home.php

ST. XAVIER'S TECHNICAL INSTITUTE

To Nurture the Joy of Excellence in the World of High Technology

CURRICULUM FOR INDUSTRIAL ELECTRONICS

Document Number: PBoS-2425-APR-23304-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	05/04/2024	INDUSTRIAL ELECTRONICS	SNJ/ VRR	VRR	SBG

EXECUTIVE SUMMARY

The Curriculum of the course *Industrial Electronics (23304)* comes under the Core Technology group and will enable the students to comprehend the theory, concepts, characteristics and working principles of industrial electronic devices and systems. Industrial Electronics plays a vital and significant role in automation, control, and power handling applications used in modern industries. This subject focuses on imparting knowledge of power electronic devices, control techniques, and industrial applications.

The prerequisite for this subject is knowledge of basic electronic devices, circuits, and fundamental electrical concepts.

The course curriculum begins with need analysis by incorporating inputs from key stakeholders such as industry experts, employers, alumni, faculty, and parents. This ensures that the curriculum remains relevant, industry-oriented, and aligned with current technological advancements.

Based on the identified needs, the course contents are structured in alignment with national standards such as AICTE, MSBTE guidelines, and the principles of NEP 2020. The curriculum integrates theoretical knowledge with practical learning and includes self-learning components and microprojects.

The course emphasizes understanding of power semiconductor devices, controlled rectifiers, inverters, choppers, and their applications in industrial control systems. It also focuses on developing skills for analyzing, designing, and implementing industrial electronic circuits.

Assessment mechanisms are designed to evaluate student performance through continuous assessment, practical work, and outcome-based evaluation methods.

Overall, the course helps students to understand core concepts of industrial electronics and equips them with the ability to analyze, design, and implement electronic systems used in industrial applications.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Dr. Vijay Rathod	Subject Expert	
2	Mr. S. N. Jirapure	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering																	
Course Code	Course Title	INDUSTRIAL ELECTRONICS													Course Type	Semester		
23304															DSC	3		
Learning Scheme						Assessment Scheme												
Actual Contact Hrs./Week			SLH	NLH	CREDITS	THEORY				PRACTICAL				SLA		Total		
								Total		FA		SA						
CL	TL	LL				FA	SA	Max	Min	Max	Min	Max	Min	Max	Min			
3	---	2	1	6	**3**	30	70	**100**	40	**25**	10	---	---	**25**	10	**150**		

1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of Practical is Internal and External.
4) Formative Assessment out of 30 marks is average of 2 periodical tests (PT).
5) The assessment of Self Learning is Internal.

RATIONALE:

This subject which comes under the Applied Technology group enables the students to comprehend the theory, construction, concepts and working principles of various basic power electronic devices and circuits and their applications in industry. The knowledge acquired by student will help them to design, test, troubleshoot and repair power electronic circuits and systems that are widely used in heavy industries, switching and control systems, induction heating, resistance welding and so on.

COURSE OUTCOMES: -- The student will be able to

Semester	3	Subject	Industrial Electronics
		4th Course In Semester Three	
CO 304.1		**Categories the working principle of static power switching Devices for power driven applications.**	
CO 304.2		**Distinguish and use various devices and turn on methods for SCR and Thyristor family**	
CO 304.3		**Compare the concept and design of single phase and three phase-controlled rectifiers**	
CO 304.4		**Illustrate the concept of Resistance and its applications**	
CO 304.5		**Justify the concept of High frequency heating. and its applications**	
CO 304.6		**Propose the concept of Ultra sonics in various Biomedical and non - destructive testing and basic applications**	

Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM III	Industrial Electronics								
CO 304	4th Course In Semester Three								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO304.1	1	2	3	2	2	3	2	2	1
CO 304.2	1	2	3	2	2	1	2	2	1
CO 304.3	3	2	2	3	1	2	2	2	1
CO 304.4	3	1	2	2	2	1	2	3	
CO 304.5	1	2	2	2	2	1	2	3	
CO 304.6	2	1	1	1		1		1	
CO TOTAL	11	10	13	12	09	09	10	13	03
CORRELATION LEVEL	2	2	2	2	2	2	2	2	1

TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

	Section -- 1						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
1	**STATIC POWER SWITCHING DEVICES**						
1.1 1.1.1 1.1.2 1.1.3 1.1.4 1.2	Thyristor Family Devices – (SCR, TRIAC and DIAC and Power MOSFET). Construction of SCR,TRIAC and DIAC. Detailed operation of SCR, TRIAC and DIAC. I-V Characteristics of SCR, TRIAC and DIAC. Specifications and ratings of SCR, TRIAC and DIAC. Applications on SCR, TRIAC, DIAC and Power MOSFET.	10	04	04	04	12	**CO 304.1**
2	**GATE TRIGGERING CIRCUITS OF SCR**						
2.1 2.2 2.3 2.4	Various Gate Triggering Methods – D.C, A.C & Pulse triggering. RC triggering circuits. UJT Construction, Characteristics and Application as Relaxation Oscillator. PUT Construction, Characteristics and Application as Relaxation Oscillator.	08	04	04	04	12	**CO 304.2**
3	**PHASE CONTROLLED CONVERTERS**						
3.1 3.2 3.3 3.3.1 3.3.2	Concept of Controlled Conversion of a.c to d.c. Various types of control techniques. Rectifier Circuits Using SCR. Single Phase Half Wave, Full Wave & Bridge Controlled Rectifier - with Resistive Load. Expressions (no derivations) for Output d.c voltage, d.c power, output a.c voltage, input a.c power.	08	04	03	04	11	**CO 304.3**

	Section -- 2						
Chapter No.	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
4	**RESISTANCE WELDING**						
4.1 4.2 4.3	Working Principle of Resistance Welding process. Electronic Circuits used in Resistance Welding – Line Contractor &Sequential Timer. Energy Storage Welding Process.	08	04	06	04	14	**CO 304.4**
5	**HIGH FREQUENCY HEATING**						
5.1 5.2 5.2.1 5.2.2 5.3 5.3.1	Need & Advantages. Induction Heating. Operating Principle. Applications – Industrial Heating, Heat Treatment. Dielectric Heating. Operating Principle Applications- Industrial, Medical.	08	04	08	04	14	**CO 304.5**
6	**ULTRASONICS**						
6.1	Introduction- Ultrasonic generation, Properties and Applications.	06	02	01	04	07	**CO 304.6**

IMPLEMENTATION STRATEGY: Use of PowerPoint presentations and Videos

1) References from the internet **(for teachers as well as students).**
2) Extensive use of examples.
3) Group discussions and micro project
4) Assignments for writing skills, create awareness about selection /purchasing components.

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME	CHAPT. NO.
1.	V-I Characteristics of SCR.	**CO406.1**	**1**
2.	V-I Characteristics of TRIAC.	**CO406.1**	**1**
3.	V-I Characteristics of DIAC.	**CO406.1**	**1**
4.	V-I Characteristics of UJT.	**CO406.1**	**1**
5.	UJT Relation Oscillator.	**CO406.2**	**2**
6.	TRIAC DIAC Light Dimmer Circuit.	**CO406.2**	**2**
7.	Single Phase Half Wave Control Rectifier.	**CO406.2**	**3**
8.	H- Bridge Using Power MOSFET.	**CO406.1**	**1**
9.	Application of Induction Heating.	**CO406.5**	**5**
10.	Ultrasonics Generation.	**CO406.6**	**6**

Fault finding practicals are demo experiments which is an extra skill imparted in the laboratory and not covered in theory.

IMPLEMENTATION STRATEGY

1. Teaching plan
2. Minimum 10 practicals

The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 25') of the defined expected course outcomes is as shown in the format given below:

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)
STUDENT							
2303001							
2303002							

*The final % attainment level for TERM WORK of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.

SUGGESTED LIST OF MICROPROJECTS

Micro project could be group based. A suggestive list is given here, similar micro projects could be added by concerned faculty. Each student will maintain dated work diary with details of individual contribution. Assessment is done by project guide based on their performance and presentation of submission.

SR. NO.	TITLE
1.	Applications based on SCR, TRIAC, DIAC and UJT.
2.	Applications based on TRIAC and DIAC for Fan Control.
3.	Applications based on Power MOSFET for Motor Speed Control.

SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
Section I						
1.	**Static Power Switching Devices**	10	04	04	04	12
2.	**Gate Triggering Circuits Of SCR**	08	04	04	04	12
3.	**Phase Controlled Converters**	08	04	03	04	11
Section II						
4.	**Resistance Welding**	09	04	08	08	14
5.	**High Frequency Heating**	09	04	08	08	14
6.	**Ultrasonics**	04	04	08	08	07
	Total	**48**	**24**	**42**	**36**	**70**
	Legends :: R ::-- Remember , U ::-- Understand , A ::--Application					

This specification table provide guide line to teacher to teach &assess student also a general guideline to frame theory paper & practical theory exam paper which student have to undertake. The actual distribution of marks at different taxonomy level in the question paper may vary from above table.

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	M. D.Singh	Powe Electronics	2nd	2006	McGraw Hill, New Delhi
2.	P.C. Sen.	Power Electronics	1st	1987	McGraw Hill, New Delhi
3.	Williams	Power Electronics & Applications	1st	1987	Macmillan Education

E REFERENCES :--

- NPTEL :: Electrical Engineering - NOC:Fundamental of Power Electronics
- https://sctevtodisha.nic.in/ content/plugins/Lecture Note
- Fundamental of Power Electronics - Course (nptel.ac.in)
- https://econtent.msbte.edu.in/econtent/econtent_home.php

ST. XAVIER'S TECHNICAL INSTITUTE

To Nurture the Joy of Excellence in the World of High Technology

CURRICULUM FOR ELECTRONICS MEASUREMENT & INSTRUMENTATION

Document Number: PBoS-2425-APR-23305-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	05/04/2024	ELECTRONICS MEASUREMENT & INSTRUMENTATION	SNJ/ AP	VRR	SBG

EXECUTIVE SUMMARY

The Curriculum of the course *Electronics Measurement & Instrumentation (23305)* comes under the Core Technology group and will enable the students to comprehend the theory, concepts, characteristics and working principles of electronic measuring instruments and systems. Measurement and Instrumentation play a crucial role in monitoring, analysis, and control of electrical and electronic systems in industrial and laboratory environments. This subject focuses on imparting knowledge of measurement techniques, instruments, sensors, and their practical applications.

The prerequisite for this subject is knowledge of basic electronic devices, circuits, and fundamental electrical quantities such as voltage, current, and resistance.

The course curriculum begins with need analysis by incorporating inputs from key stakeholders such as industry experts, employers, alumni, faculty, and parents. This ensures that the curriculum remains relevant, industry-oriented, and aligned with current technological advancements.

Based on the identified needs, the course contents are structured in alignment with national standards such as AICTE, MSBTE guidelines, and the principles of NEP 2020. The curriculum integrates theoretical knowledge with practical learning and includes self-learning components and microprojects.

The course emphasizes understanding of various measuring instruments, bridges, transducers, digital measurement techniques, and signal analysis methods. It also focuses on developing skills for selecting, operating, and analyzing measurement systems used in real-world applications.

Assessment mechanisms are designed to evaluate student performance through continuous assessment, practical work, and outcome-based evaluation methods.

Overall, the course helps students to understand core concepts of measurement and instrumentation and equips them with the ability to measure, analyze, and interpret electrical and electronic parameters accurately in industrial and laboratory applications.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Mr. Abhijit Patil	Subject Expert	
2	Mr. S. N. Jirapure	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering																	
Course Code	Course Title	ELECTRONICS MEASUREMENTS & INSTRUMENTATION													Course Type	Semester		
23305															AEC	3		
Learning Scheme						Assessment Scheme												
Actual Contact Hrs./Week			SLH	NLH	CREDITS	THEORY				PRACTICAL				SLA		Total		
								Total		FA		SA						
CL	TL	LL				FA	SA	Max	Min	Max	Min	Max	Min	Max	Min			
3	---	2	1	6	3	30	70	100	40	25	10	---	---	25	10	150		

1) IKS of 1 hrs.
2) Theory paper duration 3 hrs.
3) Theory paper assessment is Internal and External.
4) The assessment of Practical is Internal and External.
5) Formative Assessment out of 30 marks is average of 2 periodical tests (PT).
6) The assessment of Self Learning is Internal.

RATIONALE:

The 'Electronic Test Instruments' plays an important role in the field of Electronics. This is being treated as a 'Compulsory course' and intended to teach students the Principles of working, Block diagrams and Front panel controls of various Electronic Test Equipment and their applications in this field. The prerequisite for this subject is the basic knowledge of courses viz "Basic Electronics", and "Electronic Circuits".

COURSE OUTCOMES: --The student will be able to

Semester 3	Subject	Electronics Measurements & Instrumentation
CO305	5th Course In Semester Three	
CO 305.1	**Interpret the characteristics of measuring instrument.**	
CO 305.2	**Explain with sketches the construction and working principle of basic measuring Instrument.**	
CO 305.3	**Describe with sketches the procedure to convert the basic measuring instrument into Voltage, Current and Resistance measurement.**	
CO 305.4	**Illustrates the Principle and Operation of C.R.O.s.**	
CO 305.5	**Illustrates the Principle & Operation of Primarily Instruments used for the Measurements.**	
CO 305.6	**Measurement of capacitance and inductance using bridge.**	

Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM IV	Electronics Measurements & Instrumentation								
CO 305	5th Course In Semester Three								
CO 305	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 305.1									
CO 305.2	3	3	3	2	2	1	2	2	0
CO 305.3	3	3	2	1	2	1	2	2	0
CO 305.4	3	3	3	2	1	2	2	2	0
CO 305.5	3	3	3	2	1	1	2	2	0
CO 305.6	3	3	3	2	1	1	2	2	0
CO TOTAL	15	15	14	09	07	06	10	10	00
CORRELATION LEVEL	3	3	2	2	1	1	2	2	0

TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

	Section – 1						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
1	**FUNDAMENTAL's OF ELECTRONICS MEASUREMENTS**						
1.1 1.2 1.2.1 1.2.2 1.2.3 1.3	Measurement: Concept, Units of measurement of fundamental quantities, standard and their classification, Static and dynamic characteristics, types of errors. Classification of instruments: Absolute and secondary instruments. Analog and digital instruments. Mechanical, electrical and electronic instruments. Calibration: need and procedure.	06	01	06	01	08	**CO 305.1**
2	**CLASSIFICATION OF INSTRUMENTS**						
2.1 2.2 2.3	Permanent Magnet Moving Coil (PMMC) type: Dynamic Meter Movement – Construction, Operation, Advantages and Disadvantages, and Applications. Taut Band type: Construction, Operation, Advantages and Disadvantages, and Applications. Moving Iron type: Classification as Attraction type & Repulsion type, Construction, Operation, Advantages and Disadvantages, Applications, and Comparison.	10	04	06	04	14	**CO 305.2**
3	**BASIC ELECTRONIC MEASURING INSTRUMENTS**						
3.1 3.2 3.3 3.4 3.5	AMMETER: Basic D.C. Ammeter using a PMMC meter, Construction, Operation, Specifications, and Applications. VOLTMETER: Basic D.C. Voltmeter using a PMMC meter, Construction Operation, Specifications, and Applications. OHMMETER: Basic D.C. Ohmmeter using PMMC meter, Construction, Operation, Specifications, and Applications. DIGITAL MULTIMETER (D.M.M.): Block diagram and its description, Specifications, and Front Panel Control diagram. Comparison between Analog Multimeter and D.M.M.	08	03	06	04	13	**CO 305.3**

	Section – 2						
Chapter No.	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
4	**CATHODE RAY OSCILLOSCOPE**						
4.1 4.2 4.3 4.4	Single Beam type C. R. O. : Block Diagram, Functions of each block, Front Panel Control diagram, and Applications. Duel Beam C. R. O. : Block Diagram, Functions of each block, Front Panel Control diagram, and Applications. Comparison between Single & Dual Beam C.R.O.s. Electronic Switch.	12	04	08	03	15	**CO 305.4**
5	**WAVE FORM GENREATORS AND MEASURING INSTRUMENTS**						
5.1 5.1.1 5.1.2 5.2 5.2.1 5.2.2	Block diagram, with functions of each block, Front panel controls and Applications of the following Instruments: Function Generator Stroboscope Basic Concepts viz Construction, Operation, Advantages, Disadvantages and Applications of the Following: Maxwell's Bridge Hay's Bridge	12	04	08	08	20	**CO 305.5** **CO 305.6**

IMPLEMENTATION STRATEGY:

1) Use of PowerPoint presentations and Videos.
2) References from the internet **(for teachers as well as students).**
3) Extensive use of examples.
4) Group discussions and micro project.
5) Assignments for writing skills, create awareness about selection/purchasing components, instruments.

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME	CHAPT. NO.
1.	Study of Mechanical Instrument.	**C 305.2**	**2**
2.	Study of Electrical Instrument.	**C 305.2**	**2**
3.	Study of Electronics Instrument.	**C 305.2**	**2**
4.	Study PMMC Meter.	**C 305.2**	**2**
5.	Measurement of Voltage and Current Using PMMC.	**C 305.3**	**3**
6.	Study of D.M.M.- Internal Feature's Demonstration.	**C 305.3**	**3**
7.	Measurement of Voltage and Current Using DMM.	**C 305.3**	**3**
8.	C.R.O.- Front Panel Control's.	**C 305.4**	**4**
9.	C.R.O Measurements of different Parameters such as Average Voltage, Peak Voltage, etc.	**C 305.4**	**4**
10.	Maxwell's Bridge.	**C305.6**	**5**
11.	Hay's Bridge.	**C305.6**	**5**

Fault finding practicals are demo experiments which is an extra skill imparted in the laboratory and not covered in theory.

IMPLEMENTATION STRATEGY

1. Teaching plan.
2. Minimum 10 practicals.

The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 25') of the defined expected course outcomes is as shown in the format given below:

(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……).

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)	C (out of 25)
STUDENT SPNO							
2303001							
2303002							

*The final % attainment level for TERM WORK of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.

SUGGESTED LIST OF MICROPROJECTS

Micro project could be group based. A suggestive list is given here, similar micro projects could be added by concerned faculty. Each student will maintain dated work diary with details of individual contribution. Assessment is done by project guide based on their performance and presentation of submission.

SR. NO.	TITLE
1.	Designing and implementation of Maxwell's Bridge.
2.	Designing and implementation of Hay's Bridge.
3.	Designing and implementation of FET type Voltmeter.

SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Chapter No.	Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
	Section I					
1.	**Fundamentals of Electronics Measurements.**	06	01	06	01	08
2.	**Classification of Instruments.**	10	04	06	04	14
3.	**Basic Electronic measuring instruments.**	08	03	06	04	13
	Section II					
4.	**Cathode Ray Oscilloscope-Cro**	12	04	08	03	15
5.	**Waveform Generators And Measuring Instruments**	12	04	08	08	20
	Total	**48**	**19**	**33**	**18**	**70**
Legends :: R ::-- Remember , U ::-- Understand , A ::--Application						
This specification table provide guide line to teacher to teach &assess student also a general guideline to frame theory paper & practical theory exam paper which student have to undertake. The actual distribution of marks at different taxonomy level in the question paper may vary from above table.						

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	H. S. Kalsi	Electronic Instrumentation	2nd	2007	Tata Mc Graw Hill Pub. Co. Ltd, New Delhi.
2.	A. K. Sawhney	A Course in Electrical & Electronics Measurements & Instrumentation	13th	1996	Dhanpat Rai & Sons, Delhi.
3.	William D. Cooper and Albert D. Helfrick	Modern Electronic Instrumentation and Measurement Techniques	3rd	1992	Prentice Hall India, Delhi.

E REFERENCES ::--

- Lecture 01: PMMC Instrument (youtube.com)
- https://www.youtube.com/watch?v=yMgmvmf-EEM
- https://econtent.msbte.edu.in/econtent/econtent_home.php

ST. XAVIER'S TECHNICAL INSTITUTE

To Nurture the Joy of Excellence in the World of High Technology

CURRICULUM FOR PYTHON PROGRAMMING

Document Number: PBoS-2425-APR-23306-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	05/04/ 2024	PYTHON PROGRAMMING	RVG	VRR	SBG

EXECUTIVE SUMMARY

The **Python Programming** course is part of the curriculum for students enrolled in the **Diploma in Electronics & Telecommunication Engineering** program. It is designed to provide students with a comprehensive understanding of Python, a powerful and versatile programming language that is widely used in software development, data analysis, automation, and many other fields. This course introduces students to both the theoretical concepts and practical applications of Python programming.

The course is structured to be highly practical, with an emphasis on hands-on coding exercises and real-world applications. It begins with foundational topics such as Python syntax and data types, and progresses to more advanced topics like object-oriented programming (OOP), file handling, and exception handling. By the end of the course, students will have the ability to write efficient and well-structured Python programs, manipulate data, and apply Python's key features in their projects and coursework.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Dr. Mahesh Munde	Subject Expert	
2	Mr. Rameshwar Gheware	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering																
Course Code	Course Title	PYTHON PROGRAMMING												Course Type	Semester		
23306														AEC	3		
Learning Scheme						Assessment Scheme											
Actual Contact Hrs./Week			SLH	NLH	CREDITS	THEORY				PRACTICAL				SLA		Total	
								Total		FA		SA					
CL	TL	LL				FA	SA	Max	Min	Max	Min	Max	Min	Max	Min		
---	---	2	---	2	1	---	---	---	---	25	10	---	---	---	---	25	

1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of Practical is Internal and External.
4) Formative Assessment out of 30 marks is average of 2 periodical tests (PT).
5) The assessment of Self Learning is Internal.

RATIONALE:

This subject is classified under Basic Technology courses and intends to teach students concepts of programming, rules and syntax of 'Python' language, arithmetic and logical operations, use of lists, Tuples, Dictionaries, functions, Classes and files in 'Python' programming.

Python is powerful programming language . It has efficient high level data structures and simple but effective approach object oriented programming. Python code is simple, short, readable, intuitive And powerful thus it is effective for introducing computing and problem solving to beginners. Its elegant syntax and dynamic typing together with its interpreted nature makes it ideal language for scripting and rapid application development in many areas.

COURSE OUTCOMES ::--The student will be able to

Semester	3	Subject	Python Programing
CO 306		6th Course In Semester Three	
CO 306.1		**Display message on screen using Python script.**	
CO 306.2		**Develop Python program to demonstrate use of operators.**	
CO 306.3		**Perform operations on data structures in Python.**	
CO 306.4		**Develop functions for given problem.**	
CO 306.5		**Design classes for given problem.**	
CO 306.6		**Handle exceptions.**	

Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM III	Python Programming								
CO 306	6th Course In Semester Three								
CO 306	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 306.1	2	3	2	-	-	1	1	1	2
CO 306.2	2	3	2	1	1	1	1	2	3
CO 306.3	3	2	2	1	1	1	1	2	3
CO 306.4	3	2	2	1	1	1	1	1	2
CO 306.5	3	2	2	1	1	1	1	1	0
CO 306.6	2	2	3	1	1	1	1	1	0
CO TOTAL	15	14	13	05	05	06	06	08	10
CORRELATION LEVEL	3	2	2	1	1	1	1	1	2

TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6, 7, 8	9, 10, 11, 12, 13, 14	15, 16, 17, 18
CORRELATION LEVEL	0	1	2	3

	Section -- 1						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
1	**INTRODUCTION TO PYTHON**						
1.1 1.2 1.3 1.4 1.5	Features of Python- Interactive, Object oriented, Interpreted. platform independent. Python building blocks- Identifiers, Keywords, Indention, Variables, Comments. Python environment setup – Installation. Running Simple Python scripts to display welcome message. Python Data Types: Numbers, String, Tuples, Lists, Dictionary. Declaration and use of datatypes.	---	---	---	---	---	**CO 306.1**
2	**PYTHON FUNDAMENTAL OPERATORS CONTROL OPERATION**						
2.1 2.2 2.3 2.4	Basic Operators: Arithmetic, Assignment, Logical, Bitwise, Identity operators. Operator Precedence. Control Flow: Conditional Statements if, if . else, nested if. Looping in Python While loop , for loop, nested loops. Loop manipulation using continue, pass, break.	---	---	---	---	---	**CO 306.2**
3	**DATA STRUCTUERS IN PYTHON**						
3.1 3.2 3.3 3.4	Lists : Defining lists, accessing values in list, deleting values in list, updating lists. Basic list operations, Built in List Functions. Tuples : Defining tuples, accessing values in tuple. Basic Tuple operations, Built in Tuples functions. Sets : Accessing values in Set, deleting values in Set, updating Sets. Basic Set operations, Built in Set functions. Dictionaries : Accessing values in Dictionary , deleting values in Dictionary, updating Dictionary. Basic Dictionary operations, Built in Dictionaries functions.	---	---	---	---	---	**CO 306.3**

	Section -- 2						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
4	**PYHTHON MODULES & PACKAGES**						
4.1 4.2 4.3 4.4	Use of Python built in functions Math, type conversion functions. User Defined Functions: Function Definition, Function calling , Function arguments and parameter passing , return statement. Scope of variable : Global and Local variable. Modules : Importing modules, importing objects from modules. Python Packages : Using standard packages. e.g. math, SciPy, NumPy, matplotlib, pandas.	---	---	---	---	---	**CO 306.4**
5	**OOPS IN PYTHON**						
5.1 5.2 5.3 5.4 5.5	Creating Classes and Objects. Method Overloading and Overriding. Data Hiding. Data abstraction. Inheritance and composition classes.	---	---	---	---	---	**CO 306.5**
6	**PYTHON I/O FUNCTIONS**						
6.1 6.2 6.3	I/O Operations : Reading keyboard input, Printing to screen. File Handling : Opening file in different modes, accessing file content using standard library functions, Reading and writing flies, closing file. Exception Handling.	---	---	---	---	---	**CO 306.6**

IMPLEMENTATION STRATEGY:

1) Use of PowerPoint presentations and Videos
2) References from the internet **(for teachers as well as students)**
3) Extensive use of examples
4) Group discussions and micro project
5) Assignments for writing skills, create awareness about selection /purchasing components

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME	CHAPTER NO.
1.	Install & Configure Python IDE and Python program to display message on Screen.	C 304.1	
2.	Write simple Python program using Operators.	C 304.2	
3.	Write simple Python program using control / conditional statements.	C 304.1 C304.2	
4.	Write simple Python program using loops and Turtle.	C 304.1 C 304..2	
5.	Write simple Python program to perform List operation.	C 304.3	
6.	Write simple Python program to perform Tuples operation.	C 304.3	
7.	Python program to perform operation on Dictionaries.	C 304.3	
8.	Simple Python program to display waveforms using Mat Plot Lib.	C 304.3	
9.	Writing User Defined Functions.	C 304.4	
10.	Simple Python program to build GUI application.	C 304.4	
11.	Simple Python program to process Excel file using pandas data frame.	C 304.4	
12.	Simple Python program having class and objects (OOPs).	C 304.4	

Fault finding practicals are demo experiments which is an extra skill imparted in the laboratory and not covered in theory.

IMPLEMENTATION STRATEGY

1. Teaching plan
2. Minimum 10 practicals

The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 25') of the defined expected course outcomes is as shown in the format given below:
(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C202.2 (out of 25)	C202.2 (out of 25)	C202.2 (out of 25)	C202.3 (out of 25)	C202.3 (out of 25)	C202.3 (out of 25)
STUDENT SPNO							
1303001							
1303002							

The final % attainment level for TERM WORK of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.

REFERENCES ::

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	Rao.K. Nageswara Shaikh Akbar	Python Programming	4th	2000	Scitech Publications(India) Pvt
2.	Lutz, Mark	Learning Python	5th	2002	O'Reilly Publication
3.	Beazley, David	Python Essential	4th	1998	Addison-Wesley Professional
4.	Paul, Barry	Head First Python	2nd	2013	O'Reilly Publication

E REFERENCES ::--

- https://www.tutorialspoint.com/python/index.htm
- https://www.programiz.com/python-programming
- https://www.youtube.com
- https://nptel.ac.in/courses/117106113/34
- https://econtent.msbte.edu.in/econtent/econtent_home.php

ST. XAVIER'S TECHNICAL INSTITUTE

To Nurture the Joy of Excellence in the World of High Technology

CURRICULUM FOR CIRCUIT SIMULATION & CIRCUIT BUILDING

Document Number: PBoS-2425-APR-23307-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	05/04/ 2024	CIRCUIT SIMULATION & CIRCUIT BUILDING	AAP/RRS	VRR	SBG

EXECUTIVE SUMMARY

The Curriculum of the course Circuit Simulation & Circuit Building (23307) comes under the Skill Enhancement Course (SEC) group and enables students to develop practical skills in designing, simulating, and constructing electronic circuits. This subject plays a vital role in bridging the gap between theoretical knowledge and real-world applications, forming a strong foundation for hands-on learning in electronics and communication engineering.

This course focuses on imparting essential skills required for circuit simulation using modern software tools and the practical implementation of electronic circuits using basic components. It emphasizes understanding circuit behavior, analysis, testing, and troubleshooting through both virtual simulation environments and physical circuit construction. Knowledge of basic electronic devices and circuits is a prerequisite for this course.

The course curriculum begins with need analysis by incorporating inputs from key stakeholders such as industry experts, employers, alumni, faculty, and students. This ensures that the course remains skill-oriented, industry-relevant, and aligned with current technological advancements in electronics design and prototyping.

Based on the identified needs, the course content is structured in accordance with national standards such as AICTE and MSBTE guidelines along with the principles of NEP 2020. The curriculum integrates laboratory sessions, hands-on activities, and microprojects to promote experiential learning and enhance practical competence in circuit design and implementation.

Overall, Circuit Simulation & Circuit Building equips students with essential practical skills in circuit design, simulation, and implementation, preparing them for advanced studies and careers in electronics, embedded systems, and hardware development.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Mr. Abhijit Patil	Subject Expert	
2	Mr. Rakeshkumar Saroj	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering														
Course Code	Course Title	CIRCUIT SIMULATION & CIRCUIT BUILDING											Course Type	Semester	
23307													SEC	3	
Learning Scheme						Assessment Scheme									
Actual Contact Hrs./Week			SLH	NLH	CREDITS	THEORY				PRACTICAL				SLA		Total
								Total		FA		SA				
CL	TL	LL				FA	SA	Max	Min	Max	Min	Max	Min	Max	Min	
---	---	2	4	6	3	---	---	---	---	25	10	---	---	25	10	50

1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of Practical is Internal and External.
4) Formative Assessment out of 30 marks is average of 2 periodical tests (PT).
5) The assessment of Self Learning is Internal.

RATIONALE:

The objective of this subject is to involve students in actual practical work of designing, constructing, designing and building circuits pertaining to linear integrated electronics on printed circuit boards. After completing the PCB layout design using relevant software, these circuits have to built and tested for their performance, response and characteristics. This will enable the students to gain confidence with experience and the practical joy of building simple application based circuits with their implementation, so as to bring about a clear understanding of the working of these linear integrated circuits.
The details of activities and guidance concerned with the circuits to be constructed and tested by the students will be provided by the concerned teacher. The activities are designed in such a manner so as to provide maximum hands-on experiences and impart practical training and skills in circuit building and testing.

COURSE OUTCOMES ::-- The student will be able to

Semester	3	Subject	Circuit Simulation & Circuit Building
CO 307		7th Course In Semester Three	
CO 307.1		**Verify performance of the designed circuit through simulation using the "Ni MultiSim" circuit simulation software.**	
CO 307.2		**Develop soldering skills.**	
CO 307.3		**Compare the performance of the simulated circuit and physical circuit with components mounted on a printed circuit board.**	
CO 307.4		**Design, Simulate, Construct & Test the various application circuits like Regulated power supply using diode & IC, OpAmp applications circuits, Digital Circuits.**	

Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM III	Circuit Simulation & Circuit Building								
CO 307	7th Course In Semester Three								
CO 307	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 307.1	3	2	2	3		1	2	3	3
CO 307.2	3		2	1				3	2
CO 307.3	3	3	3	3	2	2	1	3	2
CO 307.4	3	3	3	2	2	2	1	2	3
CO TOTAL	12	8	10	9	4	5	4	11	10
CORRELATION LEVEL	3	2	3	2	1	1	1	3	3

TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6	7, 8, 9	10, 11, 12
CORRELATION LEVEL	0	1	2	3

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE CODE
1.	Introduction and Need of CSPCB.	-
2.	Introduction to Multisim Software.	C305.1
3.	Simulating the Schematic Diagram in Multisim Software , build and test Regulated Power supply – 5V, +/-12V, +/- 15V.	C305.2
4.	Simulate , Build & Test Integrator Using IC- 741.	C305.1
5.	Simulate , Build & Test Differentiator Using IC- 741.	C305.1
6.	Simulate, Build & Test Low Pass Filter Using IC- 741.	C305.2
7.	Simulate , Build & Test High Pass Filter Using IC- 741.	C305.2
8.	Simulate , Build & Test Monostable Multivibrator (Using IC-555).	C305.5
9.	Simulate , Build & Test Astable MultiVibrator (Using IC- 741).	C305.1
10.	Simulate , Build & Test Astable MultiVibrator (Using IC-555).	C305.5
11.	Simulate , Build & Test Gates truth table verifier.	C305.4
12.	Simulate , Build & Test Counter using flipflops.	C305.4
13.	Simulate , Build & Test LED sequence player.	C305.4

Fault finding practicals are demo experiments which is an extra skill imparted in the laboratory and not covered in theory.

IMPLEMENTATION STRATEGY

1. Teaching plan
2. Minimum 10 practicals.

The table to measure the attainment levels for TERM WORK (on a rating scale of "out of 25') of the defined expected course outcomes is as shown in the format given below:

(Note:……the table should progress to the right for Lab Experience 7, 8, 9, ….and so on……)

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	C202.2 (out of 25)	C202.2 (out of 25)	C202.2 (out of 25)	C202.3 (out of 25)	C202.3 (out of 25)	C202.3 (out of 25)
STUDENT SPNO							
1305001							
1305002							
1305004							

The final % attainment level for TERM WORK of each course outcome may then be computed and the overall % attainment level for the course, for term work may then be calculated.

E REFERENCES ::--

- https://www.tutorialspoint.com/digital_circuits/index.htm
- http://vlabs.iitb.ac.in/vlabs-dev/labs/
- https://www.mathsisfun.com/binary-digits.html
- https://econtent.msbte.edu.in/econtent/econtent_home.php

ST. XAVIER'S TECHNICAL INSTITUTE

To Nurture the Joy of Excellence in the World of High Technology

CURRICULUM FOR ESSENCE OF INDIAN CONSTITUTION

Document Number: PBoS-2425-APR-23308-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	05/04/ 2024	ESSENCE OF INDIAN CONSTITUTION	SBG	VRR	SBG

EXECUTIVE SUMMARY

The Curriculum of the course Essence of Indian Constitution (23308) comes under the Value Education Course (VEC) group and enables students to understand the fundamental principles, structure, and significance of the Constitution of India. This subject plays a vital role in developing awareness about constitutional values, rights, duties, and the functioning of democratic governance, thereby contributing to responsible citizenship and ethical conduct in society.

This course focuses on imparting essential knowledge about the historical background, framing, and key features of the Indian Constitution. It emphasizes understanding of fundamental rights, directive principles of state policy, fundamental duties, and the roles of various constitutional bodies. The subject also highlights the importance of justice, liberty, equality, and fraternity as core values guiding the nation.

The course curriculum begins with need analysis by incorporating inputs from stakeholders such as academicians, policymakers, industry representatives, and students. This ensures that the course remains relevant, value-oriented, and aligned with contemporary socio-political developments and national priorities.

Based on the identified needs, the course content is structured in accordance with national standards such as AICTE and MSBTE guidelines along with the principles of NEP 2020. The curriculum integrates interactive learning methods such as discussions, case studies, presentations, and self-learning activities to promote critical thinking and awareness of constitutional values.

Overall, Essence of Indian Constitution equips students with fundamental knowledge of constitutional principles and civic responsibilities, preparing them to become informed citizens and ethically responsible professionals contributing to nation-building.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Dr. Shivaji Ghungrad	Subject Expert	
2	Mr. Sanjiv Borkar	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering																
Course Code	Course Title	ESSENCE OF INDIAN CONSTITUTION													Course Type	Semester	
23308															VEC	3	
Learning Scheme						Assessment Scheme											
Actual Contact Hrs./Week			SLH	NLH	CREDITS	THEORY				PRACTICAL				SLA		Total	
								Total		FA		SA					
CL	TL	LL				FA	SA	Max	Min	Max	Min	Max	Min	Max	Min		
1	---	---	1	2	1	---	---	---	---	---	---	---	---	25	10	25	

1) IKS 2Hrs.
2) Theory paper duration 3 hrs.
3) Theory paper assessment is Internal and External.
4) The assessment of Practical is Internal and External.
5) Formative Assessment out of 30 marks is average of 2 periodical tests (PT).
6) The assessment of Self Learning is Internal.

RATIONALE:

Fundamental knowledge of the Indian Constitution equips production engineering professionals with essential legal, ethical, and governance insights. Understanding these fundamental of Indian constitution provides diploma engineering students with a holistic view of the constitutional values that underpin India's governance and societal framework. It encourages them to contribute responsibly to the nation's technological advancement while upholding principles of justice, liberty, equality, and fraternity.

COURSE OUTCOMES ::-- The student will be able to

Semester	3	Subject	ESSENCE OF INDIAN CONSTITUTION
CO 308		8th Course In Semester Three	
CO 308.1		**List salient features and characteristics of the constitution of India.**	
CO 308.2		**Follow fundamental rights and duties as responsible citizen and engineer of the country.**	
CO 308.3		**Analyze major constitutional amendments in the constitution.**	
CO 308.4		**Follow procedure to cast vote using voter-id.**	

Mapping of Course outcomes (COs) to Program outcomes (POs)

SEM III	ESSENCE OF INDIAN CONSTITUTION								
CO 308	8th Course In Semester Three								
CO 308	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 308.1	1	-	-	-	2	-	-	0	0
CO 308.2	1	-	-	-	2	-	-	0	0
CO 308.3	1	2	-	-	2	-	1	0	0
CO 308.4	-	-	-	1	-	-	-	0	0
CO TOTAL	03	02	-	01	06	-	01	00	00
CORRELATION LEVEL	2	1	2	1	1	1	5	0	0

TABLE TO DECIDE CORRELATION LEVELS

CO SUM TOTAL	0, 1, 2	3, 4, 5, 6	7, 8, 9	10, 11, 12
CORRELATION LEVEL	0	1	2	3

	Section -- 1						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
1	**CONSTITUTION AND PREAMBLE**						
1.1 1.2 1.3 1.4	Meaning of the constitution of India. Historical perspectives of the Constitution of India. Salient features and characteristics of the Constitution of India. Preamble of the Constitution of India.	04	---	---	---	05	**CO 306.1**
2	**FUNDAMENTAL RIGHTS AND DIRECTIVE PRINCIPLES**						
2.1 2.2 2.3	Fundamental Rights Under Part-III. Fundamental Duties And Their Significance Under Part-IV-A. Relevance Of Directive Principles Of State Policy Under Part-IV A.	06	---	---	---	10	**CO 306.2**
3	**GOVERNANCE AND AMENDMENTS**						
3.1 3.2 3.3	Amendment procedure of the Constitution and their types - simple and special procedures. The Principle of Federalism and its contemporary significance along with special committees that were setup. Major Constitutional Amendment procedure - 1st, 7th, 42nd, 44th, 73rd & 74th, 76th, 86th, 52nd & 91st, 102nd.	06	---	---	---	10	**CO 306.3**
4	**ELECTORAL LITERACY AND VOTER'S EDUCATION**						
4.1 4.2 4.3 4.4 4.5 4.6 4.7	Electoral rights , Electoral process of registration, Ethical electoral participation. Motivation and facilitation for electoral participation. Voter's guide. Prospective empowered voter. Voting procedure. Voter awareness. Voter online registration https://www.ceodelhi.gov.in/ELCdetails.asp						

SELF-LEARNING TOPICS:
1) Parts of the constitution and a brief discussion of each part.
2) Right to education and girl enrollment in schools.
3) GER of Girls and Boys.
4) Right to equality.
5) Social Democracy.
6) Women Representation in Parliament and State Assemblies.

MICRO PROJECT:
1. Organize a workshop-cum discussions for spreading awareness regarding Fundamental Rights of the citizen of the country.
2. Prepare elaborations where directive principle of State policy has prevailed over Fundamental rights with relevant Supreme Court Judgments.
3. Organize a debate on 42nd, 97th and 103rd Constitutional Amendment Acts of Constitution of India.

SEMINAR:
1. Differences in the ideals of Social democracy and Political democracy.
2. Democracy and Women's Political Participation in India.
3. Adoption of Article 365 in India.
4. Situations where directive principles prevail over fundamental rights.

GROUP DISCUSSIONS ON CURRENT PRINT ARTICLES:
- Art 356 and its working in Post-Independent India.
- Women's Reservation in Panchayat leading to Pati Panchayats - Problems and Solutions.
- Adoption of Article 365 in India.
- Need of Amendments in the constitution.
- Is India moving towards a Unitary State Model?

Note :
1) Above is just a suggestive list of micro projects and assignments; faculty must prepare their own bank of micro projects, assignments, and activities in a similar way.
2) The faculty must allocate judicial mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
3) If a micro project is assigned, it is expected to be completed as a group activity. SLA marks shall be awarded as per the continuous assessment record.
4) If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

REFERENCES ::

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	P. M. Bakshi	The Constitution of India	4th	---	Universal Law Publishing, New Delhi 15th edition, 2018, ISBN: 9386515105
2.	D. D. Basu	Introduction to Indian Constitution	5th	---	Lexis Nexis Publisher, New Delhi, 2015, ISBN:935143446X
3.	B. K. Sharma	Introduction to Constitution of India	4th	---	PHI, New Delhi, 6thedition, 2011, ISBN:8120344197
4.	B. L. Fadia	The Constitution of India	2nd	---	Sahitya Bhawan, Agra, 2017, ISBN:8193413768

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- http://www.legislative.gov.in/constitution-of-india
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