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CURRICULUM FOR MICROCONTROLLER

Document Number: PBoS-2425-April-23401-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	11 April 2024	MICROCONTROLLER	VN	VRR	SBG

EXECUTIVE SUMMARY

This curriculum on Microcontroller is designed to provide students with a comprehensive understanding of microcontroller architecture, programming concepts, and practical interfacing techniques used in modern systems. The course establishes a strong foundation in the working principles of the 8051 microcontrollers while emphasizing hands-on implementation and real-world applications.

The curriculum begins with an introduction to the fundamentals of the 8051 microcontrollers, including its architecture, features, memory organization, and operational characteristics. Students are then introduced to the 8051-instruction set, enabling them to develop assembly language programs and understand programming logic for embedded systems.

Further, the course focuses on Timer and UART Serial Port Programming, allowing learners to understand timing operations, serial communication protocols, and data transmission mechanisms essential for embedded applications. The curriculum also covers interrupt handling and interfacing with external memory, enabling students to design efficient systems capable of responding to external events and managing memory resources.

To bridge theoretical knowledge with practical implementation, the curriculum includes various applications of the 8051 microcontrollers along with interfacing techniques involving relays and motors, exposing learners to industrial automation and control system concepts. Through laboratory exercises and application-oriented activities, students gain practical skills in hardware interfacing, programming, troubleshooting, and system development.

Overall, the curriculum aims to develop analytical thinking, problem-solving abilities, and technical competencies required for designing and implementing embedded system solutions, thereby preparing students for academic advancement and industry-oriented applications in electronics, automation, and embedded technology domains.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Mr. Vinay Naglikar	Subject Expert	
2	Mr. Anil Gurav	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering																
Course Code	Course Title	MICROCONTROLLERS												Course Type	Semester		
23401														DSC	4		
Learning Scheme						Assessment Scheme											
Actual Contact Hrs./Week			SLH	NLH	CREDITS	THEORY				PRACTICAL				SLA		Total	
CL	TL	LL				FA	SA	Total		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 (Theory)out of 30 marks is average of 2 periodical tests (PT).
5) The assessment of Self Learning (SLA) is Internal.

RATIONALE:

This subject which comes under the Applied Technology group will enable the students to comprehend the theory, concepts, working of microprocessors and microcontrollers, their programming and also their applications in electronic systems. The knowledge acquired by student will help them to design, test, troubleshoot and program microcontroller-based systems. Knowledge of microprocessors will provide a quicker grasping and understanding of the internal working and operation of microcontroller-based control systems in industry.

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

Semester	4	Subject	Microcontrollers
		1st Course in Semester Four	
CO 401.1		**Analyze the architecture of 8051 Microcontrollers.**	
CO 401.2		**Develop assembly language program for microcontroller applications.**	
CO 401.3		**Illustrate the functions of SFRs in microcontroller applications.**	
CO 401.4		**Interface the special purpose peripherals 8255 and 0808 with 8051 microcontroller.**	
CO 401.5		**Demonstrate the designing of a microcontroller-based system.**	
CO 401.6		**Interface External devices with microcontroller.**	

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

SEM IV	Microcontroller								
CO 401	1st Course in Semester Four								
CO 401	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 401.1	2		2	2	2	2	2	0	0
CO 401.2	2	1	3	2	1	2	2	2	3
CO 401.3	2		3	2		2		1	3
CO 401.4	2	2	3	3	1	2	1	2	3
CO 401.5	2	2	3	3	1	2	1	2	3
CO 401.6	2	2	3	3	1	2	1	2	3
CO TOTAL	12	07	17	15	06	12	07	09	15
CORRELATION LEVEL	2	1	3	3	1	2	1	2	3

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 MICROCONTROLLER 8051**						
1.1 1.2 1.3 1.4 1.5	Simplified Block diagram of Microcontroller System, Buses & Their types: Address bus Data bus & Control Bus. Comparison between Microprocessor & Microcontroller. Specifications of MCS-51 Microcontrollers. Pin Diagram of 8051. Internal block diagram of 8051, memory organization. 8051 machine cycle concept, significance of flags, ports.	08	4	3	8	15	**CO 401.1**
2	**8051 INSTRUCTION SET**						
2.1 2.2 2.3	Detailed study of 8051 Instructions, instruction classification, Addressing modes. 8051 Programs for simple arithmetic and Logical problems. Concept of Subroutine & Stack , Delay Subroutine.	08	2	4	4	10	**CO 401.2**
3	**TIMER & (UART)SERIAL PORT PROGRAMMING**						
3.1 3.2	TMOD, TCON, Programs on Delay and counters using timer. SCON, SBUF, Programs for serial data communication.	08	2	4	4	10	**CO 401.3**

	Section -- 2						
Chapter No.	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
4	**INTERRUPTS &INTERFACING WITH EXTERNAL MEMORY**						
4.1 4.2 4.3 4.4	Semiconductor Memory: RAM, EPROM Study of Peripherals PPI 8255 interfacing with UC 8051. Interfacing with external ROM and RAM. Interrupt structure, concept of interrupt priorities, IE & IP registers,	08	4	4	7	15	**CO 401.4**
5	**APPLICATIONS OF 8051**						
5.1 5.2 5.3	ADC 0808-interfacing with 8051. 8051 Program to read data from ADC. DAC 0800-interfacing with 8051. 8051 Program to read data from DAC. Concept of KEYBOARD and LCD Display & its interfacing. 8051 program to display some numbers/characters on multiplexed display.	08	2	4	4	10	**CO 401.5**
6	**INTERFACING WITH RELAYS AND MOTORS**						
6.1 6.2 6.3	Interfacing with Relay. 8051 program to control Relay. DC motor Interfacing and PWM. 8051 program to control DC motor. Stepper Motor interfacing & 8051 program to control stepper motor.	08	2	4	4	10	**CO 401.6**

IMPLEMENTATION STRATEGY:

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

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME	CHAPT. NO.
1.	Demonstration of 8051assembler, simulator.	**CO 401.1**	**1**
2.	8051 program to move a block of data to other memory locations and to compliment a block of data in successive memory locations.	**CO 401.2**	**1**
3.	8051 program to find largest and smallest of 8 bit numbers stored in successive memory locations.	**CO 401.2**	**2**
4.	8051 program to sort five 8 bit numbers in ascending as well as descending order.	**CO 401.3**	**2**
5.	8051 program to search given byte of block in external memory and to convert a 2 digit BCD number to Hex.	**CO 401.4**	**2**
6.	To add five bytes in successive memory locations of external memory and do the same for program memory AND program to transmit and receive five bytes serially.	**CO 401.3**	**3**
7.	Using assembly language/ embedded C Program to flash L.E.D. interfaced to port of 8051.using (a) delay subroutine (b) using one of the timers of 8051 microcontroller.	**CO 401.3**	**3**
8.	Using assembly language/ embedded C Program read data from an ADC interfaced to the 8051 microcontroller.	**CO 401.4**	**4**
9.	To interface a keyboard with 8051 and read data using assembly language/ embedded C Program.	**CO 401.4**	**5**
10.	Using assembly language/ embedded C Program interface seven segment LED display with 8051.	**CO 401.5**	**5**
11.	Using assembly language/ embedded C Program interface a stepper motor with 8051.	**CO 401.6**	**6**
12.	Study of Hardware Interrupts.	**CO 401.4**	**6**
13.	To Interface LCD's.	**CO 401.6**	**6**
14.	To generate square and sawtooth waves using DAC 0832.	**CO 401.5**	**6**
15.	Interfacing 8051 with a DC Motor.	**CO 401.6**	**6**

IMPLEMENTATION STRATEGY

1. Practical Plan
2. Self-leaning tutorials, assignments, Microprojects
3. Minimum 10 to 12 practical

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	CO 302.2 (out of 25)	CO 302.2 (out of 25)	CO 302.2 (out of 25)	CO 302.3 (out of 25)	CO 302.3 (out of 25)	CO 302.3 (out of 25)
STUDENT SPN							
1303001							
1303002							
1303003							

* 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 [SELF LEARNING]

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.

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.	**Introduction To Microcontroller 8051**	08	4	3	8	15
2.	**8051 Instruction Set**	08	2	4	4	10
3.	**Timer & (Uart)Serial Port Programming**	08	2	4	4	10
	Section II					
4.	**Interrupts &Interfacing with external Memory.**	08	4	4	7	15
5.	**Applications of 8051.**	08	2	4	4	10
6.	**Interfacing with Relays and Motors.**	08	2	4	4	10
	Total	**48**	**16**	**23**	**31**	**70**
Legends :: R ::-- Remember , U ::-- Understand , A ::--Application						
This specification table provide guide line to teacher to teach &assess student also a general guide line 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.	Intel	Intel data sheets			Intel USA
2.	Muhammad Ali Mazidi	The 8051 microcontroller	1st	2002	Pearson Education Delhi Branch
3.	Kenneth Ayala	The 8051 microcontroller	3rd	1998	Prentice Hall Int
4.	Douglas V. Hal	Microprocessors& Interfacing Programming & Hardware	3rd	1998	McGraw Hill International Edition

E REFERENCES ::--

- https://datasheet4u.com/datasheet-pdf/Intel/8085/pdf.php?id=1462411
- https://datasheet4u.com/share_search.php?sWord=8051 www.Youtube.com
- https://www.keil.com
- 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 COMMUNICATION

Document Number: PBoS-2425-April-23402-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	11 April 2024	Curriculum for Digital Communication	JN & MMM	VRR	SBG

EXECUTIVE SUMMARY

Digital Communication is a core subject in the field of electronics and telecommunication engineering, focusing on the transmission, processing, and reception of information in digital form. As modern communication systems increasingly rely on digital techniques due to their robustness, efficiency, and noise immunity, this subject equips students with essential theoretical concepts and practical knowledge required to understand and design such systems.

The course begins with the fundamentals of Information Theory, which provides the mathematical framework for quantifying information. The next major area covered is Pulse Communication, which bridges analog and digital communication techniques. The subject then explores Channel Multiplexing and Binary Modulation Techniques, which are essential for transmitting digital data over communication channels.

In addition to theoretical concepts, the syllabus incorporates a comprehensive set of laboratory experiments and microprojects to reinforce practical understanding. These hands-on activities help students visualize signal waveforms, understand circuit implementations, and gain experience with real-world communication systems.

Overall, the course aims to develop competencies in analyzing, designing, and implementing digital communication systems. The defined course outcomes ensure that students can calculate performance parameters using information theory, apply pulse modulation techniques, convert analog signals to digital form, understand multiplexing methods, select appropriate modulation techniques, and recover transmitted information effectively.

Digital Communication is a foundational subject that integrates theoretical principles with practical implementation. It prepares students for advanced studies and careers in telecommunications, networking, signal processing, and embedded systems. With the rapid growth of digital technologies such as wireless communication, satellite systems, and the Internet of Things (IoT), the knowledge gained from this course is highly relevant and essential for modern engineering applications.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Mrs. Janani Natarajan	Subject Expert	
2	Dr. Mahesh Munde	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering															
Course Code	Course Title	DIGITAL COMMUNICATION												Course Type	Semester	
23402														DSC	4	
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 (Theory)out of 30 marks is average of 2 periodical tests (PT).
6) The assessment of Self Learning (SLA) is Internal.

RATIONALE:

This subject comes under the Applied Technology category. Presently, majority of the telecommunication systems operate on the basis of digital principles. It demands that the student has a good working knowledge of fundamentals of pulse and data communication. The subject will help the student in understanding the concepts of various pulse modulation techniques and methods of generating and demodulating, in each of the pulse modulation systems and digital carrier modulation systems.

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

Semester	**IV**	Subject	**Digital Communication**
		2nd Course in Semester Four	
CO 402.1		**Calculate the performance parameters of Digital Communication System using the concepts of Information theory.**	
CO 402.2		**Encode the analog information using analog pulse modulation techniques.**	
CO 402.3		**Convert analog signal into digital using different digital pulse modulation systems.**	
CO 402.4		**Categorize the various multiplexing techniques in modern digital communications.**	
CO 402.5		**Select appropriate digital modulation technique as per the system requirement.**	
CO 402.6		**Recover the original information through suitable digital demodulation technique.**	

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

SEM IV	Digital Communication								
CO 402	2nd Course in Semester Four								
CO 402	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 402.1	2	3	3		1	1	3	3	
CO 402.2	2	3	3			2	1	3	3
CO 402.3	3	3	3			2	1	3	3
CO 402.4	3	3	3	3	3	2	2	3	
CO 402.5	3	3	3			2	2	3	3
CO 402.6	2	3	3	2	2	2	2	3	3
CO Total	15	18	18	05	06	11	11	18	12
CORRELATION LEVEL	3	3	3	1	1	2	2	3	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	**INFORMATION THEORY**						
1.1 1.2 1.3 1.4 1.5 1.6	Introduction to digital communication. Block diagram of basic digital communication system. Definition and Expression for Measure of information, Amount of information, Average information (Entropy), Information rate, Channel capacity. Hartley's laws related to channel capacity. Shannon & Hartley theorem. Problems on above topics.	10	04	05	05	14	**CO 402.1**
2	**PULSE COMMUNICATIONS**						
2.1 2.2 2.2.1 2.2.2 2.2.3 2.2.4 2.2.5 2.2.6 2.2.7 2.2.8 2.2.9 2.3 2.3.1 2.3.2 2.3.3 2.3.4 2.3.5 2.3.6	Pulse modulation – Definition, Types, Comparison with CW modulation. Analog Pulse modulation: PAM, PWM & PPM. Pulse Amplitude modulation (PAM) –Definition, Waveforms. Types - Single and Double Polarity type, Flat top and Natural PAM. Generation of PAM. Pulse Width modulation (PWM) - Definition, waveforms. Types-Symmetrical, Leading edge and Trailing edge PWM. Generation of PWM. Pulse Position Modulation (PPM) Definition, waveforms. Generation of PPM from PWM; Block diagram of PPM transmitter. Comparison of PAM, PWM & PPM. Digital Pulse Modulation. Pulse Code Modulation (PCM) –Definition, Waveforms. Principles of PCM generation. Block diagram of PCM transmitter. Companding. Block diagram of PCM receiver. Delta Modulation – working principle.	14	06	10	05	21	**CO 402.2** **CO 402.3**

	Section – 2						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
3	**CHANNEL MULTIPLEXING**						
3.1 3.2 3.2.1 3.2.2 3.2.3 3.2.4 3.2.5 3.2.6	Time Division Multiplexing (TDM) Definition, Block diagram of a typical PAM TDM system, Waveforms, 5channel and 10channel PCM TDM Transmitter. Frequency Division Multiplexing (FDM). Definition, Group formation. Block diagram of 12 channel Basic group. Block diagram of Super group. Standard frequency allocations and bandwidth, Pilot carrier frequencies. General block diagram of FDM Transmitter & Receiver. Comparison of TDM & FDM systems.	10	04	05	05	14	**CO 402.4**
4	**BINARY MODULATION TECHNIQUES**						
4.1 4.1.1 4.1.2 4.1.3 4.1.4 4.2 4.2.1 4.2.2 4.2.3 4.2.4 4.3 4.3.1 4.3.2 4.3.3 4.3.4	Amplitude Shift Keying (ASK) : Definition, description, waveforms. ASK modulator. ASK receiver. Advantages, disadvantages and applications. Frequency Shift Keying (FSK) : Definition, description, waveforms. FSK modulator using Timer IC 555. FSK receiver (PLL type). Advantages, disadvantages and applications. Phase-Shift Keying (PSK): Definition, description, waveforms of BPSK signal. BPSK transmitter - Circuit diagram using Ring modulator. BPSK receiver. QAM – definition, constellation diagram, types, QAM transmitter(16 QAM only).	14	06	10	05	21	**CO 402.5** **CO 402.6**

IMPLEMENTATION STRATEGY:

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

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING	Chapter No.
1.	Pulse Amplitude Modulation using op-amp (ADTRON KIT).	**CO 405.2**	**2**
2.	Pulse Amplitude Modulation using Transistor Circuit.	**CO 405.2**	**2**
3.	Pulse Width Modulation using op-amp (ADTRON KIT).	**CO 405.2**	**2**
4.	Pulse Width Modulation using single op-amp.	**CO 405.2**	**2**
5.	Pulse Position Modulation using op-amp (ADTRON KIT).	**CO 405.2**	**2**
6.	Pulse Position Modulation using single op-amp.	**CO 405.2**	**2**
7.	Frequency Shift Keyed Modulation.	**CO 405.5**	**4**
8.	Pulse Code Modulation.	**CO 405.3**	**3**
9.	Time Division Multiplexing.	**CO 405.4**	**3**
10.	Time Division De-Multiplexing.	**CO 405.4**	**3**
11.	Pulse Code Demodulation.	**CO 405.3**	**3**
12.	Frequency Shift Keyed Demodulation.	**CO 405.6**	**4**
13.	ASK Modulation/ Demodulation (Anshuman CM6 Kit).	**CO 405.6**	**4**
14.	Frequency Division Multiplexing (Anshuman CM6 and P19 Kits).	**CO 405.4**	**4**
15.	Quadrature Amplitude Modulation (Anshuman CM6 Kit).	**CO 405.5**	**4**

IMPLEMENTATION STRATEGY

1. Practical Plan.
2. Self-leaning tutorials, assignments, Microprojects.
3. Minimum 10 to 12 practical.

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	CO 302.2 (out of 25)	CO 302.2 (out of 25)	CO 302.2 (out of 25)	CO 302.3 (out of 25)	CO 302.3 (out of 25)	CO 302.3 (out of 25)
STUDENT SPN							
1303001							
1303002							
1303003							

- 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 [SELF LEARNING]

1. Applications of PWM: Brightness control in smart lighting systems, Speed control of motors.
2. Delta modulation based voice encoder-Decoder
3. Demonstration of applications of PSK in wireless LANs, RFID and Bluetooth communication.
4. Build and test simple FSK MODEM.
5. Demonstrate a simple BPSK modulator-Demodulator

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.	**Information Theory**	10	04	05	05	14
2.	**Pulse Communications**	14	06	10	05	21
Section II						
3.	**Channel Multiplexing**	10	04	05	05	14
4.	**Binary modulation Techniques**	14	06	10	05	21
Total		**48**	**20**	**30**	**20**	**70**

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher& Address
1.	George Kennedy	Electronic Communication Systems	4th	1999	TataMcGraw-Hill New Delhi.
2.	Roddy Coolen	Electronic Communication	3rd	2000	Prentice Hall of India, New Delhi
3.	Taub Schilling	Principles of communication Systems	3rd	1986	McGraw-Hill International, New York
4.	Robert J. Schoenbeck	Electronic Communications - Modulation and Transmission	2nd	1999	Prentice Hall of India
5.	K. Sam Shanmugam	Digital and Analog Communication Systems	1st	2012	Wiley India

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- https://www.allsyllabus.com/aj/note/ECE/Digital%20Communication/unit5/index.php#. WRFlBdKGPIU
- https://www.slideshare.net/lineking/digital-communication- system
- http://www.managementstudyguide.com/digital-communication- system.htm
- http://www.uotechnology.edu.iq/depeee/lectures/4th/Electrical/Communication engineering 2/part1.pdf
- https://econtent.msbte.edu.in/econtent/econtent_home.php

ST. XAVIER'S TECHNICAL INSTITUTE

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CURRICULUM FOR CIRCUIT NETWORK

Document Number: PBoS-2425-April-23403-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	11 April 2024	CIRCUIT NETWORK	SAG	VRR	SBG

EXECUTIVE SUMMARY

This curriculum on Circuit Network is designed to provide students with a fundamental understanding of electrical circuit analysis and network behaviour under various operating conditions. The course focuses on developing analytical skills and strengthening the concepts necessary for studying electrical and electronic systems used in practical engineering applications.

The curriculum begins with Single Phase AC Circuits, where students gain knowledge of alternating current fundamentals, phasor representation, impedance concepts, and analysis of resistive, inductive, and capacitive circuits. This enables learners to understand circuit behaviour under sinusoidal excitation and evaluate circuit performance parameters.

The course further introduces Transient Behaviour and Initial Conditions, emphasizing the response of electrical circuits during switching operations and dynamic changes. Students learn to analyze transient phenomena in RL, RC, and RLC circuits and understand the influence of initial conditions on circuit response.

The curriculum also covers Resonant Circuits, providing an understanding of series and parallel resonance concepts, resonance characteristics, bandwidth, quality factor, and practical applications in communication and electronic systems.

To extend network analysis capabilities, the course includes Two-Port Networks, where students learn network parameters and methods used to simplify complex electrical systems. This knowledge supports effective Modeling and Analysis of interconnected electrical and electronic circuits.

Additionally, Passive Filters (LC Filters) are introduced to help students understand frequency-selective networks and their applications in signal processing and communication systems.

Overall, the curriculum integrates theoretical concepts with analytical problem-solving approaches to develop a strong foundation in circuit analysis and network theory. The course prepares students to understand advanced electrical and electronic subjects and equips them with essential competencies for practical engineering applications and industry requirements.

Curriculum Development Committee Members

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

Program Title	Diploma in Electronics & Telecommunication Engineering															
Course Code	Course Title	CIRCUITS & NETWORKS											Course Type	Semester		
23403													DSC	4		
Learning Scheme						Assessment Scheme										
ActualContact 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) Formative Assessment (Theory)out of 30 marks is average of 2 periodical tests (PT). 5) The assessment of Self Learning (SLA) is Internal.															

RATIONALE:

This subject comes under the Basic Technology group and intended to teach students the concepts and methods of analysis of different types of Electronic Circuits and Networks, network theorems and their applications in electrical and electronic circuits. The prerequisite for this subject is knowledge of basic electronics which is taught in the preceding semesters. It is important to note that a good knowledge of mathematics is necessary for a better understanding of this subject due to the depth of coverage, and hence the practice of the contents covered in the mathematics subjects of the first three semesters is also essential.

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

Semester	4	Subject	Circuits & Networks
CO403		3rd Course in Semester Four	
CO 403.1		**Analyze the importance of circuits and networks and its applications in Electronics engineering.**	
CO 403.2		**Sketch phasors diagram and calculate power factor, Quality factor in AC circuits.**	
CO 403.3		**Interpret the concept of time constant in DC circuit.**	
CO 403.4		**Understand the resonance condition in electrical circuits.**	
CO 403.5		**Calculate different parameters of two port Networks.**	
CO 403.6		**Design different types of passive filters.**	

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

SEM IV	Circuits & Networks								
CO 403	3rd Course in Semester Four								
CO 403.1	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 403.2	3	3	3	2	2	1	2	3	1
CO 403.3	3	3	2	1	2	1	2	3	1
CO 403.4	3	3	3	2	1	2	2	3	2
CO 403.5	3	3	3	2	1	1	2	3	2
CO 403.6	3	3	3	2	1	1	2	3	1
CO TOTAL	15	15	14	09	07	06	10	14	07
CORRELATION LEVEL	3	3	2	2	1	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
CORRELATION LEVEL	0	1	2	3

	Section -- 1						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
1	**SINGLE PHASE AC CIRCUITS**						
1.1 1.2	Series A.C. circuits: R-L, R-C and R-L-C circuits Voltage and current equations, waveforms, reactance, impedance, phasor diagram, active(Real) power, Apparent power, Reactive power, power factor. Numerical practice on above topics.	06	02	6	02	10	**CO 403.1 CO 403.2**
2	**TRANSIENT BEHAVIOR AND INITIAL CONDITIONS**						
2.1 2.2 2.2.1 2.2.2 2.3 2.3.1 2.3.2 2.4	Initial conditions in basic Passive elements. Transient response of series R-L circuit for D.C. Excitation. Transient response of Driven series R-L circuit. Transient response of source free or Undriven series R-L circuit. Transient response of series R-C circuit for D.C. Excitation. Transient response of Driven series R-C circuit. Transient response of source free or Undriven series R-C circuit. Numerical practice on above topics.	10	03	06	03	12	**CO 403.3**
3	**RESONANT CIRCUITS**						
3.1 3.2 3.3 3.4 3.5 3.6	Resonant Circuits-Definition. Q factor-Definition, Expression. Series Resonance- derivation of resonance frequency. Reactance curves, Q factor of series resonant circuit, voltage across L and C under resonance. Bandwidth and selectivity of series resonant circuit. Numerical practice on above topics.	08	04	06	03	13	**CO 403.4**

	Section -- 2						
Chapter No.	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
4	**TWO PORT NETWORKS**						
4.1 4.1.1 4.1.2 4.2 4.2.1 4.2.2 4.2.3 4.3 4.4 4.5 4.6	Symmetrical Networks : Characteristic impedance. Propagation Constant. Asymmetrical Networks. Image impedances. Iterative impedances. Image transfer constant. T and Pi network-Characteristics impedance and propagation constant formulas (no derivation). Voltage dividers-Definition. Attenuators- Definition, Design of T and Pi attenuator (only resistive). Numerical practice on above topics.	12	04	08	03	15	**CO 403.5**
5	**PASSIVE FILTERS (LC filters)**						
6.1 6.2 6.3 6.4	Design of Constant 'K' Filters – Low pass, High pass, Band pass & Band stop filter. Design of M-derived filters- Low pass, High pass filter. Comparison between Prototype and m-derived filters. Block Diagram of Composite Filter.	12	04	08	08	20	**CO 403.6**

IMPLEMENTATION STRATEGY:

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

LIST OF LABORATORY EXPERIENCES:

EXP. NO.	TITLE	COURSE OUTCOME	CHAPT. NO.
1	Variation of inductive reactance with frequency.	**CO 403.1**	**1**
2	Variation of capacitive reactance with frequency.	**CO 403.1**	**1**
3	Determine initial and final voltage across the inductor at $t=0^-$ and t=0+	**CO 403.3**	**2**
4	Determine initial and final voltage across the capacitor at $t=0^-$ and t=0+	**CO 403.3**	**2**
5	Determine Active, Reactive and Apparent power consumed in given R-L series circuit and draw phasor diagram.	**CO 403.2**	**1**
6	Determine Active, Reactive and Apparent power consumed in given R-C series circuit and draw phasor diagram.	**CO 403.2**	**1**
7	Determine Active Reactive and Apparent power consumed in given R-L-C series circuit and draw phasor diagram.	**CO 403.2**	**1**
8	Create resonance in given R-L-C circuit by varying L and C or by using variable frequency supply.	**CO 403.4**	**3**
9	Design a constant k low pass filter.	**CO 403.6**	**5**
10	Design a constant k high pass filter.	**CO 403.6**	**5**

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

IMPLEMENTATION STRATEGY

1. Practical Plan
2. Self-leaningtutorials, assignments, Microprojects
3. Minimum 10 to 12 practical

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 SPN							
1303001							
1303002							
1303003							

* 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 [SELF LEARNING]

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 diarywith details of individual contribution. Assessment is done by project guide based on their performance and presentation of submission.

SR. NO.	TITLE
1	**Single Phase A.C. series and parallel Circuits:** Prepare series circuit using variable R, L and C combination on the bread board. Measure the response and draw vector diagram. Also calculate power factor for the circuit. Write report on the
2	**Resonance in series** Circuits**:** Prepare series RLC circuit using variable R. L and C combination on the bread board. Tune the circuit for resonance condition. Measure the responses and calculate band width and Q-factor for the circuit. Write report on the same.

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.	**Single Phase AC Circuits**	06	02	06	02	10
2.	**Transient Behavior And Initial Conditions**	10	03	06	03	12
3.	**Resonant Circuits**	08	04	06	03	13
	Section II					
4.	**Two Port Networks**	12	04	08	03	15
5.	**Passive Filters**	12	04	08	08	20
	Total	**48**	**17**	**34**	**19**	**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.	Mittle V. N.	Basic Electrical Engineering	4th	2005	McGraw Hill, New Delhi.
2.	Sudhakar A	Circuit and Networks	4th	2006	McGraw Hill, New Delhi
3.	Gupta B. R.	Fundamental of Electrical Networks	2nd	2005	S. Chand & Company, New Delhi

E REFERENCES :--

- https://www.griet.ac.in/nodes/BEEE.pdf
- https://sctevtodisha.nic.in/wp-content/plugins/LectureNote
- https://www.youtube.com/elecrtic circuits
- 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 POWER ELECTRONICS

Document Number: PBoS-2425-April-23404-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	11 April 2024	POWER ELECTRONICS	AAP	VRR	SBG

EXECUTIVE SUMMARY

This curriculum on Power Electronics is designed to provide students with a comprehensive understanding of power semiconductor devices and their applications in electrical power conversion and control systems. The course focuses on developing knowledge of modern power electronic techniques used in industrial automation, motor control, and energy conversion systems.

The curriculum begins with SCR Turn-On and Turn-Off Techniques, where students learn the construction, operation, characteristics, and triggering methods of Silicon Controlled Rectifiers (SCRs). The study of commutation techniques and switching characteristics enables learners to understand the effective control and operation of power electronic devices. The course further introduces Inverters, emphasizing the principles of converting DC power into AC power. It also includes DC Choppers, which provide knowledge about DC-to-DC power conversion techniques and voltage control methods. Students learn the working principles, classification, and applications of choppers used in electric drives and power regulation systems.

To enhance practical understanding, the course covers Solid State Control of D.C. and A.C. Drives, enabling students to study speed control methods, drive characteristics, and the role of power electronic devices in efficient motor operation. This section helps learners understand modern industrial drive systems and control strategies.

Further, Power Electronics Applications are included to familiarize students with the wide range of practical uses of power electronic systems in industrial automation, renewable energy systems, electric transportation, power supplies, and control equipment. Practical examples and application-based learning help bridge theoretical concepts with real-world implementation.

Overall, the course prepares students to understand modern power conversion technologies and equips them with competencies required for advanced studies and industry-oriented applications in electrical and electronics engineering and industry requirements.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Dr. Vijay Rathod	Subject Expert	
2	Mr. Abhijit Patil	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering															
Course Code	Course Title												Course Type	Semester		
23404	POWER ELECTRONICS												DSC	4		
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) Formative Assessment (Theory) 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 of power electronics devices and their applications in electronics circuits. 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	IV	Subject	Power Electronics
		4th Course in Semester Four	
C404.1		Illustrate the turn on & turn off mechanism of SCR.	
C404.2		Demonstrate the need, function and operation of Inverter.	
C404.3		Select appropriate Chopper for DC control drives.	
C404.4		Compare the principles of AC, DC & Microprocessor, MC based drive.	
C404.5		Enumerate the operation of Power electronics applications.	

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

SEM IV	Power Electronics								
CO 404	4th Course in Semester Four								
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
C404.1	2	3	3	-	1	1	3	3	1
C404.2	2	3	3	-	-	2	1	3	2
C404.3	3	3	3	-	-	2	1	2	2
C404.4	3	3	3	3	3	2	2	3	2
C404.5	3	3	3	-	-	2	2	2	1
CO TOTAL	13	15	15	03	03	09	09	16	10
CORRELATION LEVEL	3	3	3	1	1	2	2	3	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	**SCR TURN ON/OFF TECHNIQUES**						
1.1 1.2 1.3 1.4 1.5 1.6 1.7	Introduction. Basic construction, Principle, operation and characteristics of SCR. Turn on method of SCR. Dynamic Turn on switching characteristics. Turn off mechanism. Turn off methods (commutations). Types of commutation Natural and Forced.	08	03	04	02	09	**CO 404.1**
2	**INVERTERS**						
2.1 2.2 2.3 2.4 2.5 2.6 2.6.1 2.6.2	Introduction. Working Principle of Inverters. SCR Inverters Classification: • Method of Commutation. • According to Connections. Series Inverter. Parallel Inverter. Bridge Inverters. Half bridge. Full bridge.	09	04	05	04	13	**CO 404.2**
3	**DC CHOPPERS**						
3.1 3.2 3.3 3.3.1 3.3.2 3.3.3	Introduction. Methods available for obtaining D.C. voltage from a Fixed DC Voltage. Basic Chopper Classification (Operation, Diagrams, No numerical). Step Up. Step Down. Step Up- Down.	09	03	06	04	13	**CO 404.3**

\	Section -- 2						
Chapter No	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
4	**SOLID STATE CONTROL OF D.C. & A.C. CONTROL DRIVES**						
4.1 4.2 4.3 4.4	Block schematic of DC Control Drive. Block schematic of AC Control Drive. Block schematic of microprocessor & microcontroller-based Control Drives. Advantages, Disadvantages and Applications of Motor drives.	12	05	09	04	18	**CO 404.4**
5	**POWER ELECTRONICS APPLICATIONS**						
5.1	LDR Application in a light activated turn off circuit.	10	04	09	04	17	**CO 404.5**
5.2	Illumination control using SCR.						
5.3	Applications of SCR and DIAC.						
5.4	Applications of SCR and TRIAC.						
5.5	UPS online and offline load.						

IMPLEMENTATION STRATEGY:

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

LIST OF LABORATORY EXPERIENCES

Exp. No.	Title	CO Mapping
1.	SCR Characteristics.	**CO 404.1**
2.	Turn on method of SCR (practical - 1).	**CO 404.1**
3.	Turn on method of SCR (practical - 2).	**CO 404.1**
4.	Commutation of SCR (part-1).	**CO 404.1**
5.	Commutation of SCR (part-2).	**CO 404.1**
6.	dv /dt limitation of SCR.	**CO 404.1**
7.	SCR circuit breaker.	**CO 404.1**
8.	Series Inverter.	**CO 404.2**
9.	Parallel Inverter.	**CO 404.2**
10.	Chopper circuits.	**CO 404.3**
11.	SCR triggering by Micro controller (Micro controller based firing angle control).	**CO 404.4**

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

IMPLEMENTATION STRATEGY

1. Practical Plan
2. Assignments
3. Microprojects
4. Minimum 10 to 12 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							
1303001							
1303002							
1303003							

* 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 [SELF LEARNING]

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.

- RC time delay circuit employing Diac & SCR fan temperature control.
- Fan Regulator using SCR & Triac.
- SCR & Diac for Motor Control.
- LDR for Traffic Controller.
- UPS.

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.	**Introduction To SCR.**	08	03	04	02	09
2.	**Inverters**	09	04	05	04	13
3.	**Choppers**	09	03	06	04	13
Section II						
4.	**Solid State Control of D.C. & A. C. Control Drives.**	12	05	09	04	18
5.	**Power Electronics Applications.**	10	04	09	04	17
Total		**48**	**19**	**33**	**18**	**70**

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher & Address
1.	S. K. Bhattacharya	Industrial Electronics & Control	1st	2000	Tata McGraw Hill
2.	P. C. Sen	Power Electronics	1st	1987	Tata McGraw Hill
3.	M. D Singh & K.B. Khanbchandani	Power Electronics	1st	2007	Tata McGraw Hill
4.	M. H. Rashid	Power Electronics	1st	2000	Tata McGraw Hill

E REFERENCES ::--

- https://www.nptel.ac.in/courses/108101038
- https://www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-334-power-electronics-spring-2007
- https://www.nptelvideos.in/2012/11/po wer-electronics.html
- https://www.coursera.org/learn/power-electronics
- https://www.powerguru.org/power-electronics-videos/
- 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 INTERNET OF THINGS

Document Number: PBoS-2425-April-23405-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	11 April 2024	INTERNET OF THINGS	ACG	VRR	SBG

EXECUTIVE SUMMARY

This curriculum on **Internet of Things (IoT)** is designed to provide students with a fundamental understanding of connected systems, smart devices, and emerging IoT technologies. The course focuses on developing knowledge of IoT architecture, hardware platforms, communication methods, and real-world applications.

The curriculum begins with **IoT Architecture**, introducing students to the structure, components, and layers of IoT systems, along with concepts of device connectivity and data flow. It further covers **IoT Processors and Programming Basics**, enabling learners to understand embedded platforms, programming fundamentals, and development environments used in IoT systems.

The course also emphasizes **Sensors and Communication Protocols**, providing knowledge of sensor interfacing, data acquisition, and communication technologies used for device interaction and information exchange. In addition, students are exposed to **IoT Applications**, highlighting the implementation of IoT solutions in domains such as smart homes, healthcare, industrial automation, agriculture, and smart cities.

Overall, the curriculum combines conceptual understanding with practical exposure to build technical competencies, problem-solving skills, and application-oriented knowledge required for designing and implementing IoT-based solutions in modern technological environments.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Mr. Anil Gurav	Subject Expert	
2	Mr. Rameshwar Gheware	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering																
Course Code	Course Title	INTERNET OF THINGS – IOT [Program Elective]												Course Type		Semester	
23405														SEC		4	
Learning Scheme						Assessment Scheme											
ActualContact Hrs./Week			SLH	NLH	CREDITS	THEORY				PRACTICAL				SLA		Total	
CL	TL	LL				FA	SA	Total		FA		SA					
								Max	Min	Max	Min	Max	Min	Max	Min		
1	---	2	1	4	2	---	---	---	---	25	10	50	20	50	20	125	

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 Internet of Things is a new Eco-system of actual items that are, associated, connected and open through the web in all real time. This course will enable students to understand the basics building blocks of Internet of things and its related architecture and protocols. It will introduces them and aware them about areas where Internet of Things can be applied.

Students will learn about the hardware for Internet of Things. On completion of the course, student will be able to Understand the various concepts, terminologies and architecture of IoT systems. Use sensors and actuators for design of IoT. Apply various protocols for design of IoT systems Use various techniques of data storage and analytics in IoT . Understand various applications of IoT

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

Semester	IV	Subject	Internet of Things – IoT
		5th Course in Semester Four	
CO 405.1		**Understand the concepts of Internet of Things.**	
CO 405.2		**Interpret the architecture of Internet of Things (IoT).**	
CO 405.3		**Identify roles of the processors, sensors and other devices in different IoT solutions.**	
CO 405.4		**Learn different protocols used for IoT.**	
CO 405.5		**To be familiar with data handling and analytics tools in IoT.**	
CO 405.6		**Develop various applications to understand the role of IoT in various domains.**	

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

SEM IV	Internet of Things – IoT								
CO 405	5th Course in Semester Four								
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 405.1	2	3	3		1	1	3	2	1
CO 405.2	2	3	3			2	1	2	2
CO 405.3	3	3	3			2	1	3	2
CO 405.4	3	3	3	3	3	2	2	3	2
CO 405.5	3	3	3			2	2	3	2
CO 405.6	2	3	3	2	2	2	2	3	2
CO TOTAL	15	18	18	05	06	11	11	16	11
CORRELATION LEVEL	3	3	3	1	1	2	2	3	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

Chapter No.	Topics	Periods	Marks				Cos
		Hrs.	R	U	A	Total	
1.	**IOT ARCHITECTURE**						
1.1 1.2	The architecture of IOT – its functionality and implementation in different sectors. An IOT Architecture elements such as sensors, actuators, protocols, cloud services, and layers.	3	---	---	---	---	**CO 405.1** **CO 405.2**
2.	**IOT PROCESSORS & PROGRAMMING BASICS**						
2.1 2.2 2.3	Overview of processors such as Ardunio UNO, Node MCU, ESP 8266 . Board description, Pin configuration and architecture, Device and platform features Concept of digital and analog ports. Programming Basics of Arduino data types, Variables and constants, Operators, Control Statements, Loops, Arrays, Pointer, String, functions, Pins Configured as INPUT, Pull-up Resistors, Pins Configured as OUTPUT, pinMode(), digitalWrite() analog Read() time delay() function.	4	---	---	---	---	**CO 405.2** **CO 405.4**
3	**SENSORS & COMMUNICATION PROTOCOL**						
3.1 3.2 3.3 3.4 3.5 3.6	Arduino with Humidity Sensor, Temperature Sensor, Water Detector / Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switch. Interfacing the keypad, Interfacing Servo motors to Arduino, Interfacing a RF Module. Using serial input, Controlling LEDs with keys, toggle switch, interfacing a buzzer as an alarm unit, DC motor control. IoT Protocols: HTTP-REST, MQTT, LoRa, NbIoT(features, communication, applications). Communication Protocols: IEEE802.11: Wi- Fi (features, applications), configure Wi-Fi on NodeMCU, Wi-Fi libraries, code for connecting to Wi-Fi networks ,IEEE 802.15.4, ZigBee, Z Wave. Introduction to IoT cloud platforms: AWS IoT, ThingSpeak, Google Cloud IoT, Microsoft Azure IoT. (features & uses).	5	---	---	---	---	**CO 405.2** **CO 405.3** **CO 405.4** **CO 405.5**
4	**IOT APPLICATIONS**						
4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8	Smart Home Automation. IOT Applications for industry. Smart City. Smart Self Driving car. IOT in Farming, Agricultural System. Smart Fitness & Trackers. IOT Hospitality and Tourism. Retail IOT Smart warehousing. Etc.	4	---	---	---	---	**CO 405.2** **CO 405.4** **CO 405.5** **CO 405.6**

Suggested List of Components :::--

- Arduino Uno, Node MCU, ESP 32, Raspberry Pi.
- Sensors & Actuators - Bluetooth module(HC05), MQ135,Temperature DHT11, Humidity DHT 22,Pressure BMP280, Accelerometer MPU6050, Gyroscopes , PIR sensors, Herat rate sensor, Finger print sensor, Servo Motor MG90, PIR sensor, Ultrasonic sensor, Touch sensor.
- Consumables : LED, button, connecting wires, LDR, LM35, battery, Breadboard LCD, 2-relay module etc.
- HC05 Bluetooth module.

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING	CHAPTER No
1.	Understanding Arduino UNO Board and Components.	**C405.1**	**1**
2.	Installing and work with Arduino IDE.	**C405.2**	**2**
3.	Blinking LED sketch with Arduino.	**C405.2**	**2**
4.	Simulation of 4-Way Traffic Light with Arduino.	**C405.2**	**2**
5.	Using Pulse Width Modulation.	**C405.2**	**2**
6.	Digital Read Serial Sketch Working with DHT/IR/Gas or Any other Sensor.	**C405.2 , C405.6**	**3**
7.	Interfacing of IoT processor with Environmental sensors.	**C405.2 , C405.6**	**4**
8.	Interfacing of IoT processor with Motion / Position Sensors.	**C405.2 , C405.6**	**4**
9.	Spinning a DC Motor and Motor Speed Control Sketch.	**C405.2 , C405.3**	**3**
10.	Interfacing of IoT processor with Biometric Sensors.	**C405.2 , C405.6**	**4**
11.	Working with Adafruit Libraries in Arduino.	**C405.5**	**3**
12.	Understanding ESP 32 / Node MCU function & operation details.	**C405.2 , C405.3**	**2**
13.	Controlling speed of Servo Motor.	**C405.4 , C405.5**	**3**
14.	Interfacing Arduino with Cloud (Thing speak API).	**C405.3**	**3**
15.	Installing Linux in Raspberry pi.	**C405.2 , C405.3**	**2**
16.	Installing Python in Raspberry pi, interfacing sensors to it.	**C405.2 , C405.3 , C405.6**	**2**
17.	Practical / Experiments suggested by subject teacher.	**C405.2 , C405.3 , C405.6**	
18.	Practical /Experiments suggested by subject teacher.	**C405.2 , C405.3 , C405.6**	

IMPLEMENTATION STRATEGY

1. Practical Plan.
2. Self-leaning tutorials, assignments, Microprojects.
3. Minimum 10 to 12 practical.

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 SPN							
1303001							
1303002							
1303003							

* 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 [SELF LEARNING]

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 / subject teacher based on their performance and presentation of submission.

Above is just a suggestive list of microprojects / assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way. The faculty must allocate mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.

- Design & develop IoT application for Smart Home.
- Design & develop IoT application for Home Automation.
- Design & develop IoT application for Agriculture.
- Design & develop application for Industrial IoT.
- Design & develop IoT application for Healthcare etc.

Assignments , workshop online workshops, microproject can be consider for Self-Learning activity any five activity to be perform by students for SLA.

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher
1.	Samuel Greengard	The Internet of Things	4th	1999	Tata McGraw Hill, New Delhi.
2.	Cuno Pfister	Getting started with Internet of Things	3rd	2000	Prentice Hall of India, New Delhi
3.	Peter Waher	Learning Internet of Things	3rd	1986	McGraw-Hill International, New York
4.	Rahul Dubey	An Introduction to Internet of Things	1st	2002	Cengage India Private Limited

E REFERENCES ::--

- http://www.spoken-tutorial.org
- http://swayam.gov.in
- https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013294742104276992298 93_shared/overview
- https://nptel.ac.in/courses/108108147
- https://www.allsyllabus.com/notes/ECE/IOT
- https://www.slideshare.net/lineking/IOT
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ST. XAVIER'S TECHNICAL INSTITUTE

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

CURRICULUM FOR WEB DESIGNING

Document Number: PBoS-2425-April-23406-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	11 April 2024	WEB DESIGNING	VRR	MMM	SBG

EXECUTIVE SUMMARY

This **Open Elective course on Web Designing**, offered through a **MOOC platform based on the NPTEL content or similar on Infosys Spring Board contents.** It is designed to provide students with fundamental knowledge and practical skills required for developing modern and interactive web applications. The course aims to introduce learners to the principles of website design, web technologies, and user-centric development approaches.

The curriculum focuses on key concepts of web development, including webpage structure, design elements, web technologies, interface development, and implementation techniques. Students gain exposure to designing responsive and visually effective web pages while understanding the importance of usability, accessibility, and functionality.

As an NPTEL-based MOOC course, it promotes self-paced learning and encourages students to strengthen conceptual understanding through online lectures, assignments, and practical exercises. The course enhances creativity, technical skills, and problem-solving abilities required for developing web-based solutions.

Overall, the course provides students with industry-relevant exposure and foundational competencies in web design and development, preparing them for advanced learning and practical applications in the field of web technologies and digital platforms.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Dr. Vijay Rathod	Subject Expert	
2	Dr. Mahesh Munde	Subject Expert	

Program Title	Diploma in Electronics & Telecommunication Engineering																	
Course Code	Course Title	WEB DESIGNING [Open Elective & MOOC]													Course Type	Semester		
23406															AEC	4		
Learning Scheme						Assessment Scheme												
Actual Contact Hrs./Week			SLH	NLH	CREDITS	THEORY				PRACTICAL				SLA			Total	
CL	TL	LL				FA	SA	Total		FA		SA						
								Max	Min	Max	Min	Max	Min	Max	Min			
---	---	---	---	2	1	---	---	---	---	100	40	---	---	---	---	100		

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.

COURSE OUTCOMES: -- The student will be able to

Semester	IV	Subject	Web Designing Open Elective & MOOC
		7th Course in Semester Four	
CO 406.1		Use LAMP Stack for web applications	
CO 406.2		Use Tomcat Server for Servlets and JSPs	
CO 406.3		Write simple applications with Technologies like HTML, Java script , PHP	
CO 406.4		Connect to Database and get results	
CO 406.5		To develop/build a functional website with full features.	

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

SEM IV	Web Designing Open Elective & MOOC								
CO 406	7th Course in Semester Four								
CO 406	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 406.1	3	2	1		2			1	3
CO 406.2	3	2	2	2	2	3	2	1	3
CO 406.3	3	2	2	3	2	2	2	1	3
CO 406.4	3	2	2	2	2	2	3	1	3
CO 406.5	3	3	2	2	3	2	3	1	3
CO Total	15	11	09	09	11	09	10	05	15
CORRELATION LEVEL	3	2	2	2	2	2	2	1	3

TABLE TO DECIDE CORRELATION LEVELS

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

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1.	Coding Server Client Programs.	CO 406.1
2.	Developing Web Application using HTML JavaScript.	CO 406.2 , CO 406.3
3.	Developing Advanced Web Application Programs using CSS -1.	CO 406.2 , CO 406.3
4.	Developing Advanced Web Application Programs using CSS -2.	CO 406.2 , CO 406.3
5.	Practicing PHP : Basics.	CO 406.3
6.	Practicing PHP : Web Application Development – Example -1.	CO 406.3
7.	Practicing PHP : Web Application Development- Example – 2.	CO 406.3
8.	Practicing PHP: MySql - tiered Applications.	CO 406.3
9.	Case study - fully functional Web Service Application using all the technologies learned.	CO 406.4 , CO 406.5
10.	Developing a fully functional Web Service Application using all the technologies learned -1.	CO 406.5
11.	Developing a fully functional Web Service Application using all the technologies learned -2.	CO 406.5
12.	Developing a fully functional Web Service Application using all the technologies learned -3.	CO 406.5
13.	Developing a fully functional Web Service Application using all the technologies learned -4.	CO 406.5

IMPLEMENTATION STRATEGY

- Practical plan.
- Minimum 10 to 12 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……)
* 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.

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	CO (out of 25)	CO out of 25)	CO (out of 25)	CO (out of 25)	CO (out of 25)	CO (out of 25)
STUDENT SPNO							
1303001							
1303002							
1303003							
1303004							
1303005							
1303006							

SUGGESTED LIST OF MICROPROJECTS [SELF LEARNING]

Micro project / Online course will be subjected by concerned faculty under MOOC activity . Each student will complete at least three different courses with the help of Spring Board / NPTL / Swayam portal ,which will be considered under mooc activity based on which FA -PR will be given to them.

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher& Address
1.	Jeffrey C. Jackson	Web Technologies-- A Computer Science Perspective	2nd	2000	Prentice Hall of India, NewDelhi
2.	Deitel, Goldberg	Internet & World Wide Web How To Program	1st	2001	Pearson Education
3.	Chris Bales	Web programming- Building Internet Application	1st	2003	Pearson Education

E REFERENCES :--

- http://www.spoken-tutorial.org
- http://swayam.gov.in
- https://kanchiuniv.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 PYTHON PROGRAMMING FOR ML

Document Number: PBoS-2425-April-23407-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	11 April 2024	PYTHON PROGRAMMING FOR ML	RVG	VRR	SBG

EXECUTIVE SUMMARY

This course on **Python Programming in Machine Learning** is designed to provide students with foundational knowledge and practical skills required for developing data-driven intelligent systems. The curriculum focuses on applying Python programming tools and libraries to solve real-world machine learning problems.

The course begins with **Data Pre-processing**, where students learn techniques for data cleaning, transformation, handling missing values, feature scaling, and preparation of datasets for effective model building. This stage ensures high-quality input data for accurate machine learning outcomes. It further introduces **Machine Learning concepts**, enabling learners to understand supervised, unsupervised, and basic model evaluation techniques. Students gain insight into how machines learn patterns from data and make predictions or decisions.

The curriculum also covers **Machine Learning Algorithms**, including fundamental algorithms used for classification, regression, and clustering. Emphasis is placed on understanding algorithm behaviour, implementation using Python, and performance evaluation.

Overall, the course integrates programming skills with core machine learning concepts, enabling students to develop analytical thinking and practical competency in building and deploying basic machine learning models for real-world applications.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Mr. Rameshwar Gheware	Subject Expert	
2	Mr. Anil Gurav	Subject Expert	

Program Title	**Diploma in Electronics & Telecommunication Engineering**																	
Course Code	Course Title	**PYTHON PROGRAMMING FOR ML**													Course Type	Semester		
23407															**SEC**	**4**		
Learning Scheme						Assessment Scheme												
Actual Contact Hrs./Week			SLH	NLH	**CREDITS**	THEORY				PRACTICAL				SLA			**Total**	
CL	TL	LL				**FA**	**SA**	**Total**		**FA**		**SA**						
								Max	Min	Max	Min	Max	Min	Max	Min			
1	---	2	3	6	**3**	---	---	---	---	**50**	20	**50**	20	**25**	10	**125**		
	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 the Applied Technology group and intended to teach the students basics, concepts, principles of Machine Learning. Machine Learning uses algorithms to imitate the way in which humans learn. It uses statistical methods to train models and make predictions without explicit programming them to do so. These algorithms make use of historical data to predict output values and these insights and predictions enable businesses to make smart decisions.

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

Semester	**IV**	Subject	**Python Programming for ML**
		9th Course in Semester Four	
CO 407.1		**Handle Arrays , pandas data frame and files(csv, json).**	
CO 407.2		**Data Preprocessing i.e cleaning and handling missing values.**	
CO 407.3		**Implementation of Linear Regression.**	
CO 407.4		**Implementation of Logistic Regression.**	
CO 407.5		**Implementation of K-Nearest Neighbors, SVM.**	
CO 407.6		**Implementation of K mean Clustering.**	

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

SEM IV	Python Programming for ML								
CO 407	9th Course in Semester Four								
CO 407	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 407.1	2	3	3		1	1	3	1	3
CO 407.2	2	3	3			2	1	1	3
CO 407.3	3	3	3			2	1	2	3
CO 407.4	3	3	3	3	3	2	2	2	3
CO 407.5	3	3	3			2	2	1	3
CO 407.6	2	3	3	2	2	2	2	2	3
CO TOTAL	15	18	18	05	06	11	11	09	18
CORRELATION LEVEL	3	3	3	1	1	2	2	2	3

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

Chapter No.	Topics	Periods	Marks				COs
		Hrs.	R	U	A	Total	
1.	**DATA PRE-PROCESSING**						
1.1 1.2 1.3 1.4 1.5	Data cleaning: handling missing values. Data scaling and normalization. Exploring data with Pandas and Matplotlib/Seaborn Pandas data frame and its methods i.e info, head, max, mean, median, corr, dropna. Reading CSV file. Scatter plot, Label encoding, OneHot Encoder. Study of iris dataset.	5	---	---	---	---	**CO 407.1 CO 407.2**
2.	**MACHINE LEARNING**						
2.1 2.2 2.3	Introduction Types of machine learning : Supervised and Unsupervised. Categories of Supervised machine learning: Regression and Classification.	5	---	---	---	---	**CO 407.1 CO 407.2**
3.	**ALGORITHMS OF MACHINE LEARNING**						
3.1 3.2 3.3 3.4	Regression algorithms : Linear ,Polynomial. Classification algorithms : Logistic regression, Decision Tree. Unsupervised Learing : K Mean Clustering. Introduction to Deep Machine learning.	6	---	---	---	---	**CO 407.3 CO 407.4 CO 407.5 CO 407.6**

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1.	Python program to Handle pandas data frame and files (csv,json)	CO 407.2
2.	Python program for data preprocessing i.e. data cleaning and handling missing values Part 1	CO 407.2
3.	Python program for data preprocessing 1.LabelEncoding 2. One Hot Encoder	CO 407.2
4.	Python program to implement Linear Regression using dataset 1 Python program to implement Linear Regression using dataset 2	CO 407.2
5.	Python program to implement Logistic Regression (Binary Classification)	CO 407.2
6.	Python program to implement Logistic Regression (Multiclass Classification)	CO 407.2
7.	Python program to implement Decision Tree for Classification using suitable dataset.	CO 407.5
8.	Python program to implement Random Forest Algorithm using suitable dataset.	CO 407.3
9.	Implementation of K-Nearest Neighbors	CO 407.4
10.	Implementation of support vector machine Algorithm	CO 407.4
11.	Implementation of K mean clustering Algorithm	CO 407.3

IMPLEMENTATION STRATEGY

1. Practical plan
2. Minimum 10 practical's 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……)
* 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.

LAB EXPERIENCE		1	2	3	4	5	6
	COURSE OUTCOMES	CO (out of 25)	CO out of 25)	CO (out of 25)	CO (out of 25)	CO (out of 25)	CO (out of 25)
STUDENT SPNO							
1303001							
1303002							
1303003							

SUGGESTED LIST OF MICRO PROJECT (SELF LEARNING)

Micro project could be group based. A 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 / subject teacher based on their performance and presentation of submission. Assignments , workshop online workshops can be consider for Self Learning activity, any five activity perform by students considered for SLA.

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher& Address
1.	Sebastian Raschka	Machine Learning and Deep Learning with Python	2nd	2001	Prentice Hall of India, New Delhi

ST. XAVIER'S TECHNICAL INSTITUTE

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

CURRICULUM FOR SOCIAL & LIFE SKILLS

Document Number: PBoS-2425-April-23408-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	11 April 2024	SOCIAL & LIFE SKILLS	SBG	VRR	SBG

EXECUTIVE SUMMARY

This course on **Social & Life Skills** is designed to foster holistic student development through structured engagement in community-based activities and value-driven learning initiatives. It integrates programs under **Unnat Maharashtra Abhiyan, National Service Scheme (NSS)**, **Universal Human Values & Value Education (Unnati Foundation)**, and **Financial Literacy** to build socially responsible and ethically grounded individuals.

The curriculum emphasizes experiential learning through community service, outreach activities, and societal engagement under NSS and Unnat Maharashtra Abhiyan, enabling students to understand real-world social challenges and contribute meaningfully to community development.

It further focuses on **Universal Human Values and Value Education**, aimed at developing ethical awareness, empathy, teamwork, and responsible citizenship. These components encourage students to internalize moral principles and apply them in personal, academic, and professional contexts.

In addition, the course includes **Financial Literacy**, equipping students with essential knowledge of budgeting, savings, investments, banking systems, and financial decision-making skills required for personal and professional financial well-being.

Overall, the course integrates social responsibility, ethical development, and practical life skills to shape well-rounded individuals prepared to contribute effectively to society and the workforce.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Dr. Shivaji Ghungrad	Subject Expert	
2	Mrs. Sanchita Datta	Subject Expert	

E REFERENCES ::--

- Python Machine Learning (w3schools.com)
- https://www.geeksforgeeks.org/ml-introduction-data-machine-learning/
- https://www.youtube.com
- http://vlabs.iitb.ac.in/
- https://www.mathsisfun.com/
- https://econtent.msbte.edu.in/econtent/econtent_home.php

Program Title	**Diploma in Electronics & Telecommunication Engineering**																
Course Code	Course Title	**SOCIAL & LIFE SKILLS**												Course Type	Semester		
23408														**VEC**	**4**		
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		
2	---	---	2	4	**2**	---	---	---	---	---	---	---	---	**50**	20	**50**	

1. IKS 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:

Life skills can be defined as abilities that enable humans to deal effectively with the demands and challenges of life. Social skills are a subset of life skills that are needed for successful, healthy relationships to easily adapt when moving from one social situation to the next. They help regulate our emotions effectively and develop enduring, supportive relationships, we're happier and healthier. This is why developing life skills and eventually social skills is key not only to being successful in life, it's key for our health and well-being. Thus, Teaching of Social and life skills provide students with essentials of knowing, understanding attitudes, values, morals ,social skills and better equip them to handle stress and build their self-efficacy, self-esteem and self-confidence.

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

Semester	**4**	Subject	**Social & Life Skills**
		10th Course in Semester Four	
CO 408.1		**Unnat Maharashtra Abhiyan (UMA).**	
CO 408.2		**National Service Scheme (NSS)**	
CO 408.3		**To Develop Universal Human Values**	
CO 408.4		**Value Education (Unnati Foundation)**	
CO 408.5		**Financial Literacy**	

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

SEM IV	Social & Life Skills								
CO 408	10th Course in Semester Four								
CO 408	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 408.1	1		3		1	1	1	0	0
CO 408.2	1	1	3	1		1	1	0	0
CO 408.3	2	2	3	1		1	1	0	0
CO 408.4	1	2	3	1	1		1	0	0
CO 408.5	1	2	3	1	1			0	0
CO TOTAL	6	7	15	4	3	3	4	0	0
CORRELATION LEVEL	1	2	3	1	1	1	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	**ACTIVITIES UNDER UNNAT MAHARASHTRA ABHIYAN (UMA)**						
1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 1.10 1.10.1 1.10.2 1.10.3	Introduction to Societal Needs and respective stakeholders :Regional societal issues that need engineering intervention. Multidisciplinary approach- linkages of academia, society and technology. Stakeholders' involvement. Introduction to Important secondary data sets available such as census, district economic surveys, cropping pattern, rainfall data, road network data etc. Problem Outline and stakeholders : Importance of activity and connection with Mapping of system components and stakeholders (engineering / societal). Key attributes of measurement. Various instruments used for data collection - survey templates, simple measuring equipments. Format for measurement of identified attributes/ survey form and piloting of the same. Fieldwork : Measurement and quantifications of loca systems such as agriculture produce rainfall, Road network, production in loca industries, Produce /service which move from A to B. Analysis and Report writing Report writing containing: Introduction of the topic. Data collected in various formats such as table, pie chart, bar graph etc. Observations of field visits and data collected.	04	---	---	---	---	**CO 408.1**

2	**NATIONAL SERVICE SCHEME (NSS)**						
2.1 2.2 2.3 2.4 2.5 2.6 2.7	Contacting Village/Area Leaders. Primary socio economic survey of few villages in the vicinity of the institute. Selection of the village for adoption - conduct of activities. Comprehensive Socio Economic Survey of the Village/Area. Identification of Problem(s). Dissemination of information about the latest developments in agriculture, watershed management, wastelands development, non-conventional energy, low-cost housing, sanitation, nutrition and personal hygiene, schemes for skill development, income generation, government schemes, legal aid, consumer protection and allied fields. A liaison between government and other development agencies for the implementation of various development schemes in the selected village/slum.	08	---	---	---	---	**CO 408.2**
3	**TO DEVELOP UNIVERSAL HUMAN VALUES**						
3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8	Love and Compassion (Prem and Karuna): Introduction, Practicing Love and Compassion. Truth (Satya) : Introduction, Practicing Truth (Satya). Non-Violence (Ahimsa) : Introduction, Practicing Non- Violence (Ahimsa). Righteousness (Dharma) : Introduction, Practicing Righteousness (Dharma). Peace (Shanti) : Introduction, Practicing Peace (Shanti). Service (Seva) : Introduction, Practicing Service (Seva). Renunciation (Sacrifice) Tyaga : Introduction, Practicing Renunciation (Sacrifice) Tyaga. Gender Equality and Sensitivity: Introduction, Practicing Gender Equality and Sensitivity.	04	---	---	---	---	**CO 408.3**

	Section -- 2						
Chapter No.	**Topics**	**Periods**	**Marks**				**COs**
		Hrs.	**R**	**U**	**A**	**Total**	
4	**VALUE EDUCATION (UNNATI FOUNDATION)**						
4.1 4.2 4.3 4.4	Punctuality, Icebreaker and Simple Greeting, Understanding & Managing Emotions, Introducing Self, The power of a Positive Attitude, Talking about one's Family, Talking about one's Family, Making a Positive Impression, Give word list for a Word based. Cleanliness , Hygiene and Orderliness , Likes and Dislikes, Developing Confidence in Self and Others, Strengths and Weaknesses, Listening Skills , Greeting gestures, Gender Equality and Sensitivity. Responsibility, OCSEM-Visual Comprehension and Word Based Learning, Goal Setting – Make it happen, Follow, Like & Share Unnati Social Media - Facebook / Instagram/ Twitter Introducing Others, Time Management, Talking about the daily routine, Money Management. Gratitude and Appreciation , Asking Simple Questions & Asking for the price , Stress Management, Student Referral process, Comprehending & Paraphrasing Information, A Plate of Rice and Dignity of Labour, Topics for Public Speaking, Placement Process , OCSEM-E- Newspaper, Critical Thinking to overcome challenges.	08	---	---	---	---	**CO 408.4**
4.5	Determination and Persistence, Guiding and Giving Directions, Language Etiquette & Mannerism, . Unnati Philosophy , b. Unnati Branding - Follow, Like & Share Unnati Social Media - Facebook / Instagram/ Twitter, Simple instructions to follow procedures, Assertiveness, Give topics for Debate, Describing a person/Objects, Refusal Skills, Word List for Word based Learning Respect, Comparing , OCSEM - Public Speaking, Student referral process, Attending a phone call, Being a Good Team. Player , Placement Process, At a Restaurant, Workplace ethics Team Spirit, Inviting someone, OCSEM - Picture Reading & Word, a. Unnati Philosophy & b. Unnati Branding - Follow, Like & Share Unnati Social Media - Facebook / Instagram/ Twitter, Apologizing, Apologizing, Dealing effectively with Criticism, Introduce Importance of Self Learning and upskilling.

Continue…

4.5	Caring and Sharing , Handling Customer queries, Flexibility & Adaptibility, Student referral process, Writing a Resume, OCSEM- Public Speaking, Placement Process, Meditation/ Affirmation & OCSEM-Debate, Introduce Certif- ID, how to create Certif-ID Project , Honesty, Email etiquette & Official Email communication, Alcohol & Substance use & abuse, Describing a known place , Leadership Skills, Visual Comprehension. Describing an event, OSCEM-Picture Reading & Forgive and Forget, Facing and Interview, OSCEM-Public Speaking , Attending a telephonic/Video interview & Mock Interview , Affirmation , Pat-a-Back & Closure (Valediction, Unnati Branding, Student Testimonials), Meditation/ Affirmation & Sponsor connect (Speak to UNXT HO).						
5	**FINANCIAL LITERACY**						
5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9	Introduction - Life Goals and financial goals. Savings and Investments - Three pillars of investments, Popular asset classes, Government schemes, Mutual Funds, Securities markets (Shares and bonds), Gold, Real Estate, Do's and Don'ts of investments. Retirement planning. Cashless transactions. Income, expenditure and budgeting – Concepts and Importance. Inflation- Concept, effect on financial planning of an individual. Loans – Types, Management of loans. Tax benefits. Insurance – Types, Advantages, selection Dos and Don'ts in Financial planning and Transactions.	08	---	---	---	---	**CO 408.5**

LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES :

NOT APPLICABLE.

SUGGESTED LIST OF MICRO PROJECT (SELF LEARNING)

Suggestive list of activities during Regular as well as Special Camping (NSS Activities)

Following list is only an illustrative list of the type of activities that can be undertaken. Under the programme it would be open to each NSS Unit to undertake one of these programmes or any other activity which may seem desirable to them according to local needs. The NSS Unit should aim at the integrated development of the area selected for its operation which could be a village or a slum. It has also to be ensured that at least a part of the programme does involve manual work.

1	Environment Enrichment and Conservation: The activities under this sub-theme would inter-alia, include:
1.1	plantation of trees, their preservation and upkeep Water conservation- Jaldindi, Essay competition, Drawing Competition.
1.2	Construction & maintenance of village streets, drains.
1.3	Cleaning of village ponds and wells.
1.4	Popularization and construction of Gobar Gas Plants, use of non-conventional energy.
1.5	Disposal of garbage & composting.
2	Volunteering in Election activity.
3	Participating in awareness camp of Election activity.
4	Completing the online courses of UNISEF on YEW --- compulsory activity.

ST. XAVIER'S TECHNICAL INSTITUTE

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

CURRICULUM FOR REPAIR MAINTENANCE OF CONSUMER ELECTRONIC APPLIANCES

Document Number: PBoS-2425-April-23409-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	11 April 2024	REPAIR MAINTENANCE OF CONSUMER ELECTRONIC APPLIANCES	RRS	VRR	SBG

EXECUTIVE SUMMARY

This self-learning course on **Repair and Maintenance of Consumer Electronic Appliances** focuses on foundational knowledge and practical skills related to modern home automation systems used in domestic environments. The course is designed to align with emerging smart home technologies and equip learners with relevant diagnostic and maintenance capabilities.

The curriculum begins with an **overview of home automation**, introducing the basic concepts, architecture, and working principles of automated residential systems. It further covers **common home automation components**, enabling students to understand sensors, controllers, actuators, and communication modules used in smart environments.

The course emphasizes **diagnosing common issues in home automation systems**, focusing on fault identification, troubleshooting techniques, and systematic resolution of hardware and connectivity problems. This develops analytical and problem-solving skills essential for maintenance activities.

Additionally, learners are introduced to **integration of home automation systems with smart home platforms such as Alexa and Google Home**, providing exposure to voice-controlled and IoT-enabled ecosystems. This enhances understanding of device interoperability and modern smart home configurations.

Overall, the course provides a practical, application-oriented foundation in home automation systems, preparing students with essential skills for maintenance, troubleshooting, and integration of smart consumer electronic appliances in real-world environments.

Curriculum Development Committee Members

Sr. No.	Faculty Members	Role of Faculty	Signatures
1	Mr. Shekhar Jirapure	Subject Expert	
2	Mr. Rakeshkumar Saroj	Subject Expert	

Program Title	**Diploma in Electronics & Telecommunication Engineering**																
Course Code	Course Title	**REPAIR AND MAINTENANCE OF CONSUMER ELECTRONIC APPLIANCES [Program Elective]**												Course Type	Semester		
23409														**SEC**	**4**		
Learning Scheme						Assessment Scheme											
ActualContact 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		
1	---	2	1	4	**2**	---	---	---	---	**25**	10	**50**	20	**50**	20	**125**	

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:

To give knowledge and competencies in Installation, Servicing, Repair, Fault Diagnosis and Error Removal for home appliances.

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

Semester	**IV**	Subject	**Repair And Maintenance of Consumer Electronic Appliances**
		6th Course in Semester Four	
CO 409.1		Home appliance equipment operating Skills by accessing all features and applications of the equipment.	
CO 409.2		Equipment fault diagnostics, interpret test results to identify and localize faults and repairing skills through appropriate mechanisms and tools to rectify the faults.	
CO 409.3		Component handling skills with proper safety measures to assemble/dismantle the equipment and safe removal/replacement of components using right tools.	
CO 409.4		Identifying correct software version/modules and ascertain correct and complete porting/update of software for home appliances.	
CO 409.5		Troubleshooting Skills through proper approach towards identifying a defect, make use of standard troubleshooting steps and rectify the faults.	

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

SEM IV	Repair And Maintenance of Consumer Electronic Appliances								
CO 409	6th Course in Semester Four								
CO 409	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 409.1	2	3	3		1	1	3	2	0
CO 409.2	2	3	3			2	1	2	0
CO 409.3	3	3	3			2	1	2	0
CO 409.4	3	3	3	3	3	2	2	2	2
CO 409.5	3	3	3			2	2	3	2
CO TOTAL	13	15	15	03	03	09	09	11	4
CORRELATION LEVEL	3	3	3	1	1	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

Chapter No.	Topics	Periods	Marks				Cos
		Hrs.	R	U	A	Total	
1.	**OVERVIEW OF HOME AUTOMATION**						
1.1 1.1.1 1.1.2 1.1.3	Concepts and Technologies. Benefits and applications of home automation systems. Safety precautions when working with electronic systems. Fundamentals of electricity and circuits. Understanding voltage, current, and resistance. Reading and interpreting electrical diagrams and schematics.	3	---	---	---	---	**CO 409.1**
2.	**OVERVIEW OF COMMON HOME AUTOMATION COMPONENTS**						
2.1 2.2 2.3 2.4 2.5	Sensors, actuators, controllers. Understanding communication protocols. (e.g., Wi-Fi, Bluetooth, Zigbee) Identifying and troubleshooting common issues with components. Proper installation techniques for home automation systems. Connecting and configuring sensors, actuators, and controllers , Pairing devices and setting up communication protocols.	4	---	---	---	---	**CO 409.2 CO 409.4**
3	**DIAGNOSING COMMON ISSUES WITH HOME AUTOMATION SYSTEMS**						
3.1 3.2 3.3 3.4	Using multimeters and other testing equipment for troubleshooting. Identifying faulty components and wiring problems. Repairing or replacing faulty sensors, actuators, or controllers Soldering techniques for electronic connections. Firmware updates and reprogramming of devices.	5	---	---	---	---	**CO 409.2 CO 409.3**
4	**CONNECTING HOME AUTOMATION SYSTEMS TO SMART HOME PLATFORMS**						
4.1	Setting up automation routines and voice control. **(E.G., AMAZON ALEXA, GOOGLE HOME)** Troubleshooting integration issues and compatibility conflicts.	4	---	---	---	---	**CO 409.5**
4.2	Regular maintenance tasks for home automation systems.						
4.3	Cleaning and dusting components Upgrading firmware and software to the latest versions.						
4.4	Understanding security risks and vulnerabilities in home automation systems.						

LIST OF LABORATORY EXPERIENCES

EXP. NO.	TITLE	COURSE OUTCOME MAPPING
1.	Install and configure various home automation components such as sensors, actuators, and controllers.	CO 409.2 , CO 409.3 , CO 409.4
2.	Use multimeters and testing equipment to diagnose and troubleshoot problems.	CO 409.2 , CO 409.3 CO 409.4 , CO 409.5
3.	Identify faulty components, faulty components or wiring issues in a home automation system.	CO 409.2 , CO 409.3 CO 409.4 , CO 409.5
4.	Update firmware and software of home automation devices.	CO 409.2 , CO 409.3 , CO 409.4
5.	Configure devices to connect to a central hub or smart home platform & test device integration and communication within the home automation network.	CO 409.2 , CO 409.3 , CO 409.4
6.	Connect a home automation system to a smart home platform (e.g., Amazon Alexa, Google Home).	CO 409.5
7.	Set up automation routines and voice control for various devices.	CO 409.2 , CO 409.3 , CO 409.4
8.	Implement security measures, such as encryption protocols and user authentication.	CO 409.2 , CO 409.3 , CO 409.4
9.	Analyse real-world scenarios and challenges in the installation, repair, and maintenance of home automation systems	CO 409.2 , CO 409.3 , CO 409.4
10.	Implement security measures, such as encryption protocols and user authentication.	CO 409.2 , CO 409.3 , CO 409.4

IMPLEMENTATION STRATEGY

1. Practical Plan.
2. Self-leaning tutorials, assignments, Microprojects.
3. Minimum 10 to 12 practical.

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 SPN							
1303001							
1303002							
1303003							

* 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 [SELF LEARNING]

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 / subject teacher based on their performance and presentation of submission.

- Design & develop application for Smart Home.
- Diagnosis Application for Home Automation.
- Case study in application for Industry automation.
- Visit Automation sites & prepare report.

Assignments, workshop ,online workshops can be consider as a Self-Learning activity any Three activities to be perform by students for SLA.

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher
1.	R Morrison	Practical Electronics - A Self-Teaching Guide :178 (Wiley Self- Teaching Guides)	2nd	1999	R Morrison John Wiley & Sons Inc
2.	Newton C Braga	Electronics for the Electrician	3rd	2000	S. Chand (G/L)& Company Ltd

E REFERENCES ::--

- https://www.electronicrepairguide.com
- https://www.ambitautomation.in/courses/home-automation-training/

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 RENEWABLE ENERGY TECHNOLOGIES

Document Number: PBoS-2425-April-23410-00

REV. NO.	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	APPROVED BY
00	11 April 2024	RENEWABLE ENERGY TECHNOLOGIES	VRR	RVG	SBG

EXECUTIVE SUMMARY

This **Open Elective course on Renewable Energy Technologies**, offered through **MOOC platforms such as NPTEL or Infosys Springboard**, is designed to provide students with fundamental knowledge of sustainable energy systems and their engineering applications. The course focuses on the principles, technologies, and implementation of renewable energy sources to address global energy demands and environmental challenges.

The curriculum introduces major renewable energy sources including solar, wind, hydro, and biomass systems, along with their working principles and energy conversion processes. Students gain an understanding of system configurations, efficiency considerations, and integration of renewable energy into modern power systems.

Delivered through self-paced online learning modules, the course leverages video lectures, assessments, and assignments available on NPTEL and Infosys Springboard platforms. This MOOC-based approach enhances flexibility, accessibility, and continuous skill development aligned with industry and academic requirements.

Overall, the course equips students with essential knowledge of renewable energy technologies and their real-world applications, fostering sustainability awareness and preparing learners for advanced studies and careers in the energy and power sector.

Curriculum Development Committee Members

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

Program Title	Diploma in Electronics & Telecommunication Engineering																
Course Code	Course Title	RENEWABLE ENERGY TECHNOLOGIES [Open Elective & MOOC]												Course Type	Semester		
23410														AEC	4		
Learning Scheme						Assessment Scheme											
Actual Contact Hrs./Week			SLH	NLH	CREDITS	THEORY				PRACTICAL				SLA		Total	
CL	TL	LL				FA	SA	Total		FA		SA					
								Max	Min	Max	Min	Max	Min	Max	Min		
---	---	02	---	2	**1**	---	---	---	---	**100**	40	---	---	---	---	**100**	

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 the Open elective group and intended to teach the students learn basics, concepts, principles of new technologies of other core branches & their importance, relevance with core knowledge.

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

Semester	IV	Subject	Renewable Energy Technologies Open Elective & MOOC
		8th Course in Semester Four	
CO 410.1		**Understand present and future energy scenario of the world.**	
CO 410.2		**Understand various methods of solar energy harvesting.**	
CO 410.3		**Identify various wind energy systems.**	
CO 410.4		**Evaluate appropriate methods for Bio energy generations from various Bio wastes.**	
CO 410.5		**Identify suitable energy sources for a location.**	

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

SEM IV	Renewable Energy Technologies Open Elective & MOOC								
CO 410	8th Course in Semester Four								
CO 410	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2
CO 410.1	3	2	1		2			2	1
CO 410.2	3	2	2	2	2	3	2	1	1
CO 410.3	3	2	2	3	2	2	2	2	2
CO 410.4	3	2	2	2	2	2	3	2	
CO 410.5	3	3	2	2	3	2	3	2	
CO TOTAL	15	11	9	9	11	9	10	9	4
CORRELATION LEVEL	3	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

Chapter No.	Topics	Periods	Marks				COs
		Hrs.	R	U	A	Total	
1.	**OCEAN ENERGY TECHNOLOGIES**						
1.1 1.2 1.3 1.4 1.5 1.6	Ocean energy map of India and its implications; Specification, Construction and working of the following. Ocean energy technologies. Tidal power technologies. Wave power technologies. Marine current technologies. Ocean Thermal Energy Conversion (OTEC) technologies.	---	---	---	---	---	---
2.	**SOLAR PV AND CONCENTRATED SOLAR POWER PLANTS**						
2.1 2.2 2.3 2.4 2.5	Solar Map of India: Global solar power radiation, Solar PV. Concentrated Solar Power (CSP) plants, construction and working of: Power Tower, Parabolic. Trough, Parabolic Dish, Fresnel Reflectors. Solar Photovoltaic (PV) power plant: components layout, construction, working. Rooftop solar PV power system.	---	---	---	---	---	---
3.	**LARGE WIND POWER PLANTS**						
3.1 3.2 3.3	Wind Map of India: Wind power density in watts per square meter, Lift and drag principle; long path theory, Geared type wind power plants: components, layout and working, Direct drive type wind power plants: components, layout and working, Constant Speed Electric. Generators: Squirrel Cage Induction Generators (SCIG), Wound Rotor Induction Generator (WRIG), Variable Speed Electric. Generators: Doubly-fed induction generator (DFIG), wound rotor synchronous generator (WRSG), Permanent magnet synchronous generator (PMSG).	---	---	---	---	---	---
4.	**BIO-ENERGY**						
4.1	Biomass direct combustion; Biomass gasifiers; Biogas plants; Digesters; Ethanol production; Bio diesel; Biomass Applications.	---	---	---	---	---	---
5.	**OTHER RENEWABLE ENERGY SOURCES**						
5.1	Tidal energy; Wave Energy; Open and Closed OTEC Cycles; Small Hydro-Geothermal Energy; Hydrogen and Storage; Fuel Cell Systems; Hybrid Systems.	---	---	---	---	---	---

SUGGESTED LIST OF MICROPROJECT (SELF LEARNING)

Micro project / Online course will be suggested by concerned faculty under MOOC activity . Each student will complete at least three different courses with the help of Spring Board / NPTL / Swayam portal ,which will be considered under MOOC activity based on which FA -PR will be given to them.

REFERENCES

Sr. No.	Author	Title	Edition	Year of Publication	Publisher& Address
1.	Rai. G. D.	Non-Conventional Energy Sources	2nd	2001	Khanna Publishers India, New Delhi
2.	G. N Tiwari and M. K. Ghoshal,	Fundamental of Renewable Energy Sources	1st	2007	Narosa, New Delhi
3.	N. H. Ravindranath, U. K Rao, B. Natarajan, P Monga	Renewable Energy and Environment-A Policy Analysis for India	1st	2006	Tata McGraw Hill

E REFERENCES ::--

- http://www.spoken-tutorial.org
- http://swayam.gov.in
- https://kanchiuniv.ac.in
- https://econtent.msbte.edu.in/econtent/econtent_home.php