NUTAN MAHARASHTRA VIDYA PRASARAK MANDAL'S

NUTAN MAHARASHTRA INSTITUTE OF ENGINEERING AND TECHNOLOGY

AN AUTONOMOUS INSTITUTE | UNDER ADMINISTRATIVE SUPPORT OF PCET

Curriculum Structure and Syllabus of Second Year B. Tech. Electronics and Telecommunication Engineering (2025 Pattern)

Nutan Maharashtra Vidya Prasarak Mandal's (NMVPM's)

NUTAN MAHARASHTRA INSTITUTE OF ENGINEERING AND TECHNOLOGY (NMIET)

An Autonomous Institute from 2025 - 26

Under Administrative Support - Pimpri Chinchwad Education Trust (PCET)

ESTD : 1906

Course Approval Summary – Board of Studies Electronics and Telecommunication Engineering

Sl. No.	Approved By	Signature and Stamp of Authority
1	Chairman, Board of Studies, Electronics and Telecommunication Engineering	
2	Secretary, Academic Council, NMIET, Pune	
3	Chairman, Academic Council, NMIET, Pune	Director Nutan Maharashtra Institute of Engineering & Technology Talegaon Dabhade - 410507

Nutan Maharashtra Instt. of Engg. & Technology
Talegaon Dabhade 410507

VISION OF THE INSTITUTE

To be a notable institution for providing quality technical education and ensuring ethical, moral and holistic development of students.

MISSION OF THE INSTITUTE

To nurture engineering graduates with state of the art competence, professionalism and problem solving skills to serve needs of industry as well as society.

VISION OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

To be a renowned department of Electronics and Telecommunication engineering for providing quality technical education through holistic development of the students.

MISSION OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

- To impart quality technical education for students with continuous upgraded teaching learning process.
- To enhance the employability and entrepreneurship through Industry Institute association.
- To enhance the research competency in students by adapting state of art technology in Electronics and Communication Engineering.
- To inculcate the needs of profession for the society.

INDEX

COURSE-WISE CREDIT DISTRIBUTION

Sl. No.	Type of Course	No. of Courses	Total Credits	
			No.	%
1.	Basic Science Course (BSC)	8	14	8.14
2.	Engineering Core Course (ECC)	10	15	8.72
3.	Programme Core Course (PCC)	28	54	31.40
4.	Programme Elective Course (PEC)	9	20	11.63
5.	Multidisciplinary Minor (MDM)	7	13	7.56
6.	Open Elective Course (OEC)	3	8	4.65
7.	Vocational and Skill Enhancement Course (VSEC)	4	8	4.65
8.	Ability Enhancement Course (AEC)	2	4	2.33
9.	Entrepreneurship / Management Course(EMC)	2	4	2.33
10.	Value Education Course (VEC)	2	4	2.33
11.	Experiential Learning Courses	8	22	12.79
12.	Indian Knowledge System	1	2	1.16
13.	Co-curricular Courses	2	4	2.33
TOTAL		**86**	**172**	**100**

SEMESTER-WISE COURSE DISTRIBUTION

COURSE DISTRIBUTION: SEMESTER WISE										
Sl. No.	**TYPE OF COURSE**	**NO. OF COURSES / SEMESTER**								**Total**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
1.	Basic Science Course (BSC)	4	4	-	-	-	-	-	-	8
2.	Engineering Science Course (ESC)	6	4	-	-	-	-	-	-	10
3.	Programme Core Course (PCC)	-	2	5	5	5	5	4	2	28
4.	Programme Elective Course (PEC)	-	2	-	-	2	3	2	2	11
5.	Multidisciplinary Minor (MDM)	-	-	1	1	2	1	-	2	7
6.	Open Elective Course (OEC)	-	-	1	1	1	-	-	-	3
7.	Vocational and Skill Enhancement Course (VSEC)	1	1	1	1	-	-	-	-	4
8.	Ability Enhancement Course (AEC)	1	1	-	1	-	-	-	-	3
9.	Entrepreneurship / Management Course(EMC)	-	-	1	1	-	-	-	-	2
10.	Value Education Course (VEC)	-	-	1	1	-	-	-	-	2
11.	Experiential Learning Courses	-	-	-	1	1	1	1	1	5
12.	Indian Knowledge System	-	1	-	-	-	-	-	-	1
13.	Co-curricular Courses	1	1	-	-	-	-	-	-	2
Total		**13**	**16**	**10**	**12**	**11**	**10**	**07**	**07**	**86**

SEMESTER-WISE CREDIT DISTRIBUTION

COURSE DISTRIBUTION: SEMESTER WISE										
1 Lecture hour = 1 Credit, 2 Lab Hours = 1 Credit, 1 Tutorial Hour = 1 Credit										
Sl. No.	**TYPE OF COURSE**	**NO. OF COURSES / SEMESTER**								**Total**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
1.	Basic Science Course (BSC)	7	7	-	-	-	-	-	-	14
2.	Engineering Science Course (ESC)	9	6	-	-	-	-	-	-	15
3.	Programme Core Course (PCC)	-	3	10	10	10	8	8	4	53
4.	Programme Elective Course (PEC)	-	-	-	-	4	8	4	4	20
5.	Multidisciplinary Minor (MDM)	-	-	2	2	4	2	-	4	14
6.	Open Elective Course (OEC)	-	-	4	2	2	-	-	-	8
7.	Vocational and Skill Enhancement Course (VSEC)	2	2	2	2	-	2	-	-	10
8.	Ability Enhancement Course (AEC)	2	-	-	2	-	-	-	-	4
9.	Entrepreneurship / Management Course(EMC)	-	-	2	2	-	-	-	-	4
10.	Value Education Course (VEC)	-	-	2	-	-	-	-	-	2
11.	Experiential Learning Courses	-	-	-	2	2	2	8	8	22
12.	Indian Knowledge System	-	2	-	-	-	-	-	-	2
13.	Co-curricular Courses	2	2	-	-	-	-	-	-	4
Total		**22**	**22**	**22**	**22**	**22**	**22**	**20**	**20**	**172**

CURRICULUM STRUCTURE

Second Year B. Tech. E and TC Engineering

Semester – III

Level 5.0																	
Second Year B. Tech E and TC Engineering																	
Semester III																	
Sl. No.	**Course Code**	**Course Type**	**Course Name**	**Credit Scheme**			**Teaching Scheme (Hours/Week)**			**Examination Scheme and Marks**							
										CCE		**ESE**					
				TH	**TUT**	**PR**	**L**	**T**	**P**	**UT**	**FA**	**SA**	**PR**	**OR**	**TW**	**TOTAL**	
										25	**25**	**50**					
1	ETC25PCC-201	Programme Core Course	Feedback Control System	2			2			25	25	50				**100**	
2	ETC25PCC-202	Programme Core Course	Digital System Design	2			2			25	25	50				**100**	
3	ETC25PCC-203	Programme Core Course	Digital System Design Lab			2			4				50		25	**75**	
4	ETC25PCC-204	Programme Core Course	Semiconductor Devices and Applications	2			2			25	25	50				**100**	
5	ETC25PCC-205	Programme Core Course	Semiconductor Devices and Applications Lab			2			4				50		25	**75**	
6	ETC25MDM-206	Multi-disciplinary Minor Course	Data Structures and Algorithms	2			2			25	25	50				**100**	
7	-	Open Elective Course	Open Elective Course - I	3	1		3	1		25	25	50				**100**	
8	-	Value Education Course	Value Education Course-I		1	1		1	2						25	**25**	
9	ETC25VSEC-209	Vocational and Skill Enhancement Course	Vocational and Skill Enhancement Course-I			2			4					25	25	**50**	
10	IL25EMC-210	Entrepreneurship / Management Course	Principles of Management and Entrepreneurship		1	1		1	2						25	**25**	
TOTAL				11	3	8	11	3	16	**125**	**125**	**250**	**100**	**25**	**125**	**750**	
				22			**30**										

CCE- Comprehensive Continuous Evaluation**, ESE**- End Semester Evaluation, **TW**-Term Work, **OR**-Oral, **PR**-Practical, **TH**- Theory**, L**-Lecture, **T**/**TUT**-Tutorial, **UT**- Unit Test, **FA**–Formative Assessment, **SA** – Summative Assessment

Basket: List of Open Elective Courses -I

Course Code	Course Name	
CE25OEC-207	Computational Mathematics	Choose Any One
CAI25OEC-207	Probability Theory and Statistical Methods	
AIDS25OEC-207	Probability and Statistics	
IT25OEC-207	Numerical Statistical Analysis	
ETC25OEC-207	Vectors and Transforms	
ME25OEC-207	Applied Mathematics	

Basket: List of Value Education Courses -I

Course Code	Course Name	
CSE25VEC-208	Universal Human Values	Choose Any One
ETC25VEC-208A	Professional Ethics for Engineers	
ETC25VEC-208B	Social Connect and Responsibility	

Basket: List of Vocational and Skill Enhancement Courses -I

Course Code	Course Name	
ETC25VSEC-209 A	Electronic Measurement Tools and Techniques	Choose Any One
ETC25VSEC-209 B	Programming Foundations Laboratory	

CURRICULUM STRUCTURE
Second Year B. Tech. E and TC Engineering

Semester – IV

Level 5.0																	
Second Year B. Tech E and TC Engineering																	
Semester IV																	
Sl. No.	**Course Code**	**Course Type**	**Course Name**	**Credit Scheme**			**Teaching Scheme (Hours/Week)**			**Examination Scheme and Marks**							
										CCE		**ESE**					
				TH	**TUT**	**PR**	**L**	**T**	**P**	**UT**	**FA**	**SA**	**PR**	**OR**	**TW**	**TOTAL**
										25	**25**	**50**				
1	ETC25PCC-251	Programme Core Course	Electrical Networks and Machines	2			2			25	25	50				**100**
2	ETC25PCC-252	Programme Core Course	Signals and Systems	2			2			25	25	50				**100**
3	ETC25PCC-253	Programme Core Course	Signals and Systems Lab			2			4				50		25	**75**
4	ETC25PCC-254	Programme Core Course	Communication Systems	2			2			25	25	50				**100**
5	ETC25PCC-255	Programme Core Course	Communication Systems Lab			2			4				25		25	**50**
6	ETC25MDM-256	Multi-disciplinary Minor Course	Multi-disciplinary Minor- II	2			2			25	25	50				**100**
7	-	Open Elective Course	Open Elective Course - II	2			2			25	25	50				**100**
8	-	Value Education Course	Value Education Course-II	1	1		1	1							25	**25**
9	ETC25ELC-259	Experiential Learning Course	Community Engagement Project			2			4					50		**50**
10	IL25EMC-260	Entrepreneurship / Management Course	Entrepreneurship Skills Development		1	1		1	2						25	**25**
11	IL25AEC-261	Ability Enhancement Course	Modern Indian Languages (Marathi)	1		1	1		2						25	**25**
TOTAL				12	2	8	12	2	16	**125**	**125**	**250**	**75**	**50**	**125**	**750**
				22			**30**									

CCE- Comprehensive Continuous Evaluation**, ESE**- End Semester Evaluation, **TW**-Term Work, **OR**-Oral, **PR**-Practical, **TH**- Theory**, L**-Lecture, **T/TUT**-Tutorial, **UT**- Unit Test, **FA**–Formative Assessment, **SA** – Summative Assessment

Basket: List of Open Elective Courses–II

Course Code	Course Name	
CE25OEC-257	Digital Marketing	Choose Any One
ETC25OEC-257	Engineering Economics	
ME25OEC-257	Digital Finance	

Basket: List of Value Education Courses -II

Course Code	Course Name	
CE25VEC-258	Indian Constitution	Choose Any One
AIDS25VEC-258	Environmental Science	

Course Syllabus
Semester-III

Program	S. Y. B. Tech. (E and TC)				Semester : III		
Course	Feedback Control System				Code:	ETC25PCC-201	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites: Laplace Transform, Determinants and Matrix

Course Objectives: This course aims at enabling students:

1. To Introduce elements of control systems, their transfer function with various methods and time domain analysis.
2. To Introduce the time & frequency response techniques for stability analysis.
3. To Introduce State Variable Analysis method.
4. To classify various feedback controllers for industrial Automation.

Course Outcomes: After successful completion of the course, learner will be able to:

CO1: Analyze the transfer function of control system and evaluate time-domain responses of first and second-order systems to understand their behavior and performance.

CO2: Apply the root locus & bode plot method to determine the stability of control systems, ensuring they operate within desired parameters.

CO3: Solve system equations using state-variable representations, enabling the analysis and design of complex control systems using modern control theory.

CO4: Compare and contrast various feedback controllers (e.g., P, PI, PID) and understand their roles in industrial automation, facilitating the design of effective control systems.

Course Contents

Unit	Description	Duration [Hrs]
I	**Transfer function & Time Domain Analysis** Basic Elements of Control System, Open loop and Closed loop systems, Differential equations and Transfer function, concept of pole and zero, ORDER and TYPE of a system, transfer function of Electric systems, transfer function using Block diagram reduction and Signal flow graph techniques. Standard test inputs for time domain analysis, Steady state response - Steady state error and static error constants. Transient analysis of first and second order systems. Time domain specifications of second order system for step response. Characteristic equation of a system, Examine the impact of pole locations in the s-plane on system response and stability, including the effects of pole placement on system performance.	09
II	**Stability Analysis** Concept of stability -absolute stability, relative stability, Routh-Hurwitz stability criterion, Root locus: definition, magnitude and angle conditions, construction of root locus, concept of dominant poles, effect of addition of pole and zero on root locus. Application of root locus for stability analysis. Frequency response Analysis: frequency domain specifications, correlation between time domain and frequency domain specifications.	08

III	**Modern Control Theory** State space advantages and representation, Transfer function from State space, physical variable form, phase variable forms: Concept of Controllability and Observability, controllable canonical form, observable canonical form, Solution of homogeneous state equations, state transition matrix and its properties, computation of state transition matrix by Laplace transform method only.	**07**
IV	**Controllers and Automation in Industrial Control Systems** Concept of Controller, Basic ON-OFF Controller, Introduction to P, I, D, PI, PD and PID controller, Introduction to Programmable Logic Controller (PLC) and IoT based Industrial Automation - introduction, block diagram, working principles and its need.	**06**
	Total	**30**

Text Books:

1. N. J. Nagrath and M. Gopal, Control System Engineering, New Age International Publishers, 5th Edition.
2. K. Ogata, Modern Control Engineering, Prentice Hall India Learning Private Limited; 5th Edition

Reference Books:

1. Benjamin C. Kuo, Automatic control systems, Prentice Hall of India, 7th Edition.
2. M. Gopal, Control System Principles and Design, Tata McGraw Hill, 4th Edition.
3. Schaums Outline Series, Feedback and Control Systems Tata McGraw-Hill.2nd Edition.

e-sources:

1. NPTEL Course Control System https://nptel.ac.in/courses/107/106/107106081/
2. NPTEL Course Control System Design https://nptel.ac.in/courses/115/108/ 115108104/

Program	S. Y. B. Tech. (E and TC)				Semester : III		
Course	Digital System Design				Code:	ETC25PCC-202	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites: Basic gates, Number Systems

Course Objectives: This course aims at enabling students:

1. To develop a K-map and its use to the design the various applications of combinational digital circuits.
2. To analyze sequential logic using flip flops and their applications viz. counters, processes and implement logical operations.
3. To gain conceptual clarity of sequential circuit principles and apply them to model, design, and analyze state machines.
4. To explore various digital logic families and utilize programmable logic devices (PLDs) for the design and implementation of digital system

Course Outcomes: After successful completion of the course, learner will be able to:

CO1: Analyze, design, and implement combinational logic circuits using Boolean algebra and Minimization techniques.
CO2: Design and verify sequential logic circuits using flip-flops, registers, and counters.
CO3: Develop finite state machines and algorithmic state machines.
CO4: Evaluate digital logic families and design digital systems using programmable logic devices (PLDs).

Course Contents

Unit	Description	Duration [Hrs]
I	**Combinational Logic Design**: Definition of combinational logic, Standard representations for logic functions, k-map representation of logic functions (SOP and POS forms), minimization of logical functions for min- terms and max-terms (up to 4 variables), don't care conditions, Design Examples: Half Adder, Full adder, Half Subtractor, Full Subtractor, Adder and their use as subtractor, Code converters (BCD to Gray, BCD to Excess-3, 4-bit Binary to Gray), 2- bit Comparator, Multiplexers, multiplexer trees, Implementation of SOP and POS using MUX, Demultiplexers, Demultiplexer trees and 3: 8 Decoders. Case Study:- Arithmetic Logic Unit (ALU), Scientific calculator, computing engines, industrial control systems and consumer electronics.	9
II	**Sequential Logic Design:** 1-Bit Memory Cell/latch, Clocked SR flip flop, J-K flip flop, M-S J-K flip flop, D and T flip- flops. Use of preset and clear terminals in flip flops, Excitation Table for flip flops, Conversion of flip flops, Registers, shift registers, Counters (ring counters, twisted ring counters), ripple counters, Mod-n counters, up/down counters, synchronous counters, Sequence Generators using flip flops. Case Study: - Memories, Rolling display boards, Microprocessors, Consumer electronics.	9

III	**State Machines** Moore and Mealy machines, State diagram, State table, State reduction, State assignment, Finite state machine implementation, Sequence detector. Introduction to Algorithmic state machines- construction of ASM chart and realization for sequential circuits. Case Study:- ATM machine, vending machine and traffic lights	**6**
IV	**Digital Logic Family and Programmable Logic Devices** Digital Logic Family: Performance parameters of digital ICs- fan in, fan out, noise margin, propagation delay, power dissipation. Operation of TTL NAND gate. CMOS inverter, NAND, NOR gates. Comparison of CMOS and TTL. Programmable Logic Devices: Detail architecture of PROM, PAL, PLA and Designing combinational circuits using PLDs. General Architecture and specifications of FPGA and CPLD. Case Study:- High speed computing boards, automotive electronics.	**6**
	Total	**30**

Text Books:

1. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill Publication, Fourth Edition.
2. Thomas Floyd, "Digital Fundamentals", Pearson Publication, India, 10th Edition.

Reference Books:

1. John. F. Wakerly, "Digital Design- Principles and Practices", Pearson Publication,4th Edition.
2. M. M. Mano, "Digital Design," Prentice Hall India, 4th Edition.
3. Stephen Brown, "Fundamentals of digital logic design with VHDL" Tata McGraw Hill Publication, 2nd Edition.

e-sources:

1. https://www.mheducation.co.in/modern-digital-electronics-9789355321770-india
2. MOOC / NPTEL/YouTube Links: https://nptel.ac.in/courses/108/105/108105132

Program	S.Y. B. Tech. (E and TC)			Semester : III			
Course	Digital System Design Lab			Code		ETC25PCC-203	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	-	4	-	50	-	25	75

Pre-requisites: Basic gates, Number Systems

Course Objectives: This course aims at enabling students:

1. To Introduce the fundamentals of digital logic: logic gates, Boolean algebra, number systems, and logic functions.
2. To Enable students to design and implement combinational logic circuits (adders, subtractors, encoders/decoders, multiplexers/demultiplexers, code-converters, etc.).
3. To Enable students to design and implement sequential logic circuits (flip-flops, counters, shift registers, registers, etc.).

Course Outcomes: After successful completion of the course, learner will be able to:

CO1: Recognize and use basic logic gates and ICs; identify pin configurations; understand truth tables and Boolean functions.

CO2: Simplify Boolean expressions (e.g. via K-Maps) and implement them in SOP/POS using logic gates.

CO3: Design, realize, and test combinational logic circuits such as adders, subtractors, encoders, decoders, multiplexers/demultiplexers, code-converters, etc.

CO4: Design, realize, and test sequential logic circuits like flip-flops, counters, shift registers, and small memory/timing circuits.

Course Contents

Sl. No.	Suggested List of Experiments/Assignments
1	Design and implement full adder and full subtractor function using IC-74138.
2	Design and implement 3-bit Binary to Gray code converter and BCD to Excess-3 code converter using IC-74138.
3	Design and Implement 8:1 MUX using IC-74153 & Verify its Truth Table. Design & implement the given 4-variable function using IC-74153. Verify its Truth Table.
4	Design and Implement 1-digit BCD adder using IC-7483.
5	Design & Implement 1 bit magnitude comparator.
6	Design and Implement MOD-N and MOD-NN using IC-7490 and draw Timing diagram.
7	Design & Implement Up/down Counter with mode control using IC-74191 / IC-74193. Draw Timing Diagram.
8	Design and Implement 4-bit right shift and left shift register using D-flip flop IC-7474.
9	Design and Implement Pulse train generator using IC-74194 / IC-7495 (Use right/left Shift). 10
10	Design and Implement 4-bit Ring Counter / Twisted ring Counter using shift registers IC-74194 / IC-7495.

11	Mandatory Practical: Mini Project involving design and development of a working model.
12	Virtual Lab on Digital Applications
13	Virtual Lab on Hybrid Electronics

Reference Books:

1. John. F. Wakerly, "Digital Design- Principles and Practices", Pearson Publication,4th Edition.
2. M. M. Mano, "Digital Design," Prentice Hall India, 4th Edition.
3. Stephen Brown, "Fundamentals of digital logic design with VHDL" Tata McGraw Hill Publication, 2nd Edition.

e-sources:

1.https://da-iitb.vlabs.ac.in/List%20of%20experiments. html.
2.https://he-coep.vlabs.ac.in/List%20of%20experiments.html.

Program	S. Y. B. Tech. (E and TC)				Semester : III		
Course	Semiconductor Devices and Applications				Code:	ETC25PCC-204	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites: Basic of Semiconductor Materials

Course Objectives: This course aims at enabling students:

1. To analyze the semiconductor device MOSFET, its characteristics, parameters & applications.
2. To comprehend the concepts of feedback and analyze the characteristics and applications of feedback in amplifiers, oscillators, and phase-locked loops (PLLs**)**Operational amplifier, concept, parameters & applications.
3. To analyze Analog-to-Digital Converters (ADC) and Digital-to-Analog Converters (DAC) as interfaces between analog and digital systems.
4. To design and analyze voltage-to-current and current-to-voltage converter circuits.

Course Outcomes: After successful completion of the course, learner will be able to:

CO1: Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.

CO2: Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.

CO3: Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.

CO4: Compare the principles of various data conversion techniques and PLL with their applications.

Course Contents

Unit	Description	Duration [Hrs]
I	**MOSFET and its Analysis** Enhancement MOSFET: MOSFET DC Load line, AC equivalent circuit, Parameters. Non ideal characteristics: Finite output resistance, Body effect, Sub-threshold conduction, breakdown effects, temperature effect, effect of W/L ratio, Common source amplifier & analysis, Source follower: circuit diagram, comparison with common source, Frequency response for CS amplifier. Comparison between BJT & MOSFET	8
II	**MOSFET Circuits** MOSFET as switch, CMOS inverter, resistor & diode. Current sink & source, Current mirror. Types of feedback, Four types of feedback topologies, Effects of feedback, Voltage series & current series feedback amplifiers and analysis. Barkhausen criterion, Types of Oscillators, RC phase shift oscillator, Crystal Oscillator.	7
III	**Operational amplifier and linear Applications** Block diagram, Op amp parameters, Current mirror, Op-amp characteristics (AC & DC). Inverting amplifier (Voltage series), non-inverting amplifier (voltage shunt), Effect on Ri, Ro, gain & bandwidth., Voltage follower, Summing amplifier, Differential amplifier, Practical integrator, first Order Low pass, Practical differentiator, High Pass Filter, Precision half-wave Rectifier	8

IV	**Op-amp and Non-Linear Applications** Comparator, Schmitt trigger, Square & triangular wave generator, PWM Generator DAC & ADC: Resistor weighted and R-2R DAC, SAR, Flash and dual slope ADC Types / Techniques, Characteristics, block diagrams, Circuits, Specifications, Merits, Demerits, Comparisons	**7**
	Total	**30**

Text Books:

1. Donald Neaman, Electronic Circuits - Analysis and Design, Mc Graw Hill, 3rd Edition.
2. Ramakant Gaikwad, Op Amps & Linear Integrated Circuits, Pearson Education,4th Edition

Reference Books:

1. Millman Halkias, Integrated Electronics. Phillip E. Allen and Douglas R. Holberg, CMOS Analog Circuit Design, Oxford, 2nd Edition.
2. Salivahan and Kanchana Bhaskaran, Linear Integrated Circuits, Tata McGraw Hill, 2nd Edition.

e-sources:

1. https://www.analog.com/en/design-center/design-tools-and-calculators/ltspice-simulator.html
2. https://archive.org/details/microelectronicc00sedr
3. NPTEL Course Analog Electronic Circuits 108105158/ https://nptel.ac.in/courses/108/105/
4. NPTEL Course on Analog Circuits: https://nptel.ac.in/courses/108101094

Program	S. Y. B. Tech. (E and TC)			Semester : III			
Course	Semiconductor Devices and Applications Lab			Code		ETC25PCC-205	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	-	4	-	50	-	25	75

Pre-requisites: Basic Electronics devices

Course Objectives: This course aims at enabling students:

1. To study the characteristics of MOSFETs, including their transfer characteristics and determination of the operating point.
2. To analyze the concepts of feedback and analyze its role in amplifiers and oscillators.
3. To comprehend the operational amplifier, its internal concept, key parameters, and practical applications.
4. To analyze the working principles of ADCs and DACs and their role as interfaces between analog and digital domains

Course Outcomes: After successful completion of the course, learner will be able to:

CO1: Assimilate the physics, characteristics and parameters of MOSFET towards its application as amplifier.

CO2: Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications.

CO3: Design, Build and test Op-amp based analog signal processing and conditioning circuits towards various real time applications.

CO4: Compare the principles of various data conversion techniques and PLL with their applications.

Course Contents

Sl. No.	Suggested List of Experiments/Assignments
1	Design, build single stage CS configuration & verify DC operating point and comment on results.
2	Implement current series feedback amplifier & measure R_{if}, R_{of}, G_{mf} and comment on result.
3	Design, build & test integrator/differentiator using Op-Amp and comment on result.
4	Design, build & test Schmitt trigger using Op-Amp and comment on result.
5	Design & implement adjustable voltage regulator using IC LM317/LM337 and comment on result.
6	Simulate voltage series feedback amplifier & measure R_{if}, R_{of}, A_{vf}, bandwidth and comment on result.
7	Design, build & test square and triangular waveform generator using Op-Amp.
8	Design, build & test 2 or 3-bit R-2R ladder DAC.
9	Design, build & test half-wave and full-wave rectifier.
10	Design, build & test first order active low pass / high pass filter.

e-sources :

1. http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/
2. http://vlabs.iitkgp.ernet.in/be/

Program	S. Y. B. Tech. (E and TC)			Semester : III			
Course	Data Structure and Algorithms			Code:	ETC25MDM-206		
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites: Fundamentals of Programming Languages, Basics of C Programming

Course Objectives: This course aims at enabling students:

1. To recognize the importance of data structures and apply searching and sorting techniques using the C programming language.
2. To learn the concepts of time and space complexity and understand their role in evaluating algorithm performance.
3. To learn the representation, implementation, and applications of linear and non-linear data structures.

Course Outcomes: After successful completion of the course, learner will be able to:

CO1: Apply and implement fundamental searching and sorting algorithms on given data using the C programming language.
CO2: Design and develop applications of stacks and queues using arrays.
CO3: Implement linked lists and demonstrate their practical applications.
CO4: Construct, represent, and perform various traversals on a Binary Search Tree (BST) and traverse different types of graphs.

Course Contents

Unit	Description	Duration [Hrs]
I	**Introduction to Data Structures and Complexity Analysis of Algorithms** Overview of Data Structures: Linear vs. Non-linear Data Structures types, Linear vs. Non-linear, Abstract Data Types (ADT). Algorithm Analysis: Time and Space Complexity Analysis. Asymptotic Notations: Big O, Omega, Theta Notations Searching Algorithms: Linear Search, Binary Search. Sorting Algorithms: Bubble, Selection, Insertion Sorting Algorithms	8
II	**Stack and Queue** Stacks: Concept, Basic Stack operations, Array representation of stacks, Stack as ADT, Stack Applications: Reversing data, Arithmetic expressions conversion and Examination. Queues: Concept, Queue operations, Array representation of queues, Queue as ADT, Circular queues, Application of queues: Categorizing data, Simulation of queues.	8
III	**Linked List** Concept of linked organization, singly linked list, stack using linked list, queue using linked list, doubly linked list, circular linked list, Linked list as ADT. Representation and manipulations of polynomials using linked lists, comparison of sequential linked organization with linked organization	7
IV	**Non-linear Data Structure: Tree and Graphs** Introduction to tree: Basic Tree Concepts. Binary Tree: Concept & Terminologies, Representation of Binary Tree in memory, Traversing a binary tree. Binary Search Tree (BST): Basic Concepts, BST operations. Graph: Basic Concepts & terminology, Representation of graph: Adjacency matrix, Adjacency list. Operations on graph: Traversing a graph. Spanning tree: Minimum	7

	Spanning tree- Kruskal's Algorithm, Prim's Algorithm; Dijkstra's Shortest Path Algorithm.	
	Total	**30**

Text Books:

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures, Galgotia Books Source, 2nd Edition
2. Richard. F. Gilberg and Behrouz A. Forouzan, Data Structures: A Pseudocode Approach with C, Cengage Learning, 2nd Edition.

Reference Books:

1. Seymour Lipschutz, Data Structure with C, Schaum's Outlines, Tata McGraw Hill. ISBN-10: 1259029964.
2. E Balgurusamy - Programming in ANSI C, Tata McGraw-Hill, Third Edition. ISBN-10: 1259004619.
3. YedidyahLangsam, Moshe J Augenstein, Aaron M Tenenbaum – Data structures using C and C++ - PHI Publications, Second Edition. ISBN 10: 8120311779 .

e-sources:

1. https://onlinecourses.swayam2.ac.in/nou23_cs13/preview
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013842032404848640104 70_shared/overview
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013299625203884032379 /overview

Program	S. Y. B. Tech. (Open Elective Course-I)			Semester: III			
Course	Computational Mathematics			Code:	CE25OEC-207		
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
4	3	-	1	25	25	50	100

Pre-requisites: Basic knowledge of algebra, trigonometry, and calculus from First-Year Engineering Mathematics.

Course Objectives: This course aims at enabling students:

1. To develop foundational knowledge of logic, sets, functions, relations, and combinatory.
2. To model and analyze computational problems using discrete mathematical structures.
3. To Learn conceptual clarity and knowledge of Statistical methods and probability.
4. To apply Numerical techniques to approximate solutions for interpolation, integration, and ordinary differential equations.
5. To analyze different transform methods like Fourier/Z transforms.

Course Outcomes: After completion of the course, the students will be able to:

CO1: Apply propositional/predicate logic and proof techniques for problem solving.
CO2: Solve counting problems using combinatory and recurrence relations.
CO3: Apply Statistical methods, such as correlation and regression, to analyze and interpret experimental data relevant to reliability engineering and probability theory in testing and quality control.
CO4: Obtain Interpolating polynomials, numerically differentiate and integrate functions, and numerically solve differential equations using single-step and multi-step iterative methods in modern scientific computing.
CO5: Apply transforms to engineering systems related to signals, circuits, and control applications.

Course Contents

Unit	Description	Duration [Hrs]
I	**Logic, Proof Techniques & Sets** Propositional logic, truth tables, Predicate logic, quantifiers Logical implications, inference rules Proof techniques: direct, contradiction, contrapositive, Mathematical induction Sets: set operations, algebra of sets Functions: injective, surjective, bijective	9
II	**Relations, Recurrence & Combinatory** Recurrence relations (basic introduction) Relations: definition, properties, equivalence relations, partial orders Combinatory: Permutations & combinations, Pigeonhole principle Inclusion–exclusion principle	9
III	**Statistics & Probability** Introduction to Data Science, Measures of central tendency, Measures of dispersion, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation: Karl Pearson's correlation, Spearman's rank correlation, Regression analysis, and Reliability of regression estimates. Probability, Probability density function, and Central limit theorem, Probability distributions: Binomial, Poisson, Normal, and Test of hypothesis: Chi-square test	9
IV	**Numerical Methods** Interpolation: Finite Differences, Newton's and Lagrange's interpolation formulae, Numerical differentiation. Numerical Integration: Trapezoidal and Simpson's	9

	rules, Bound of truncation error. Solution of ordinary differential equations: Euler's method, Modified Euler's method, Runge-Kutta 4th order method, introduction to Predictor-Corrector methods.	
V	**Fourier and Z-Transforms** **Fourier Transform:** Introduction to time-domain and frequency-domain representation of signals. Complex exponential form of Fourier series. Fourier integral representation. Fourier Transform and inverse Fourier Transform. Properties of Fourier Transform such as linearity, time shifting, frequency shifting, and scaling. Fourier sine and cosine transforms with inverses. **Z-Transform:** Discrete-time signals and systems. Definition of Z-transform and region of convergence (ROC). Z-transform of basic sequences. Properties of Z-transform. Inverse Z-transform using standard pairs and partial fraction method. **Applications of Z-Transform:** Application of Z-transform in solving linear difference equations, analysis of discrete-time systems, stability analysis, and modeling of simple digital filters., Fourier sine and cosine transforms and their inverses.	**9**
	Total	**45**

Text Books:

1. Rosen, K. H., Discrete Mathematics and Its Applications, 8th Edition, McGraw-Hill Education, 2019. ISBN: 978-1-259-67651-2.
2. Kolman, B., Busby, R. C., & Ross, S., Discrete Mathematical Structures, 6th Edition, Pearson/Prentice Hall, 2009/2010. ISBN: 978-0-13-229751-6.
3. Lipschutz, S., & Lipson, M., Schaum's Outline of Discrete Mathematics, Revised 3rd Edition, McGraw-Hill Education, 2009. ISBN: 978-0-07-161586-0.
4. Grimaldi, R. P., Discrete and Combinatorial Mathematics: An Applied Introduction, 5th Edition, Pearson/Addison-Wesley, 2004 (reprints 2013). ISBN: 978-0-321-21103-3.
5. Ramana, B. V., Higher Engineering Mathematics, Tata McGraw-Hill, 2006. ISBN: 978-0-07-063419-0.

Reference Books:

1. Kenney, J. F. and Rosen, K. H., Discrete Mathematics, 1st Edition, McGraw-Hill Education, 2012. ISBN: 978-0-07-338309-5
2. Biggs, N. L., Discrete Mathematics, 2nd Edition, Oxford University Press, 2003.ISBN: 978-0-19-850717-8
3. Graham, R. L., Knuth, D. E. and Patashnik, O., Concrete Mathematics: A Foundation for Computer Science, 2nd Edition, Addison-Wesley, 1994. ISBN: 978-0-201-55802-9
4. Deo, N., Graph Theory with Applications to Engineering and Computer Science, Prentice-Hall of India, 1974. ISBN: 978-0-13-363473-0
5. Epp, S. S., Discrete Mathematics with Applications, 4th Edition, Cengage Learning, 2011. ISBN: 978-0-495-39132-6
6. Kreyszig, E., Advanced Engineering Mathematics, Wiley Eastern Ltd., New Delhi (Indian Edition), 1999 (Reprinted). ISBN: 978-81-224-0883-6
7. Jain, M. K., Iyengar, S. R. K. and Jain, R. K., Numerical Methods for Scientific and Engineering Computation, 7th Edition, Khanna Publishers, 2013. ISBN: 978-81-7409-205-9

e-sources:

1. https://onlinecourses.nptel.ac.in/noc20_cs82/preview
2. https://onlinecourses.nptel.ac.in/noc25_cs27/preview

Program	S. Y. B. Tech. (Open Elective Course-I)			Semester: III			
Course	Probability Theory and Statistical Methods			Code:		CAI25OEC-207	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
4	3	-	1	25	25	50	100

Pre-requisites: Prior knowledge of basic understanding of algebra and arithmetic operations is essential.

Course Objectives: This course aims at enabling students:

1. To introduce the fundamental concepts of probability, random variables, and distributions required to model real-world uncertainty.
2. To develop the ability to analyse discrete and continuous probability models and interpret their applications.
3. To provide understanding of statistical measures, sampling techniques, and the behaviour of sample data.
4. To explain estimation methods, hypothesis testing, and inference techniques used for data-driven decision making.
5. To enable students to apply probability and statistical tools for solving practical engineering and computational problems.

Course Outcomes: After completing this course, students will be able to:

CO1: Explain random variables, probability distributions and their properties.

CO2: Apply standard discrete and continuous distributions to solve problems.

CO3: Analyze statistical measures and perform hypothesis testing for decision-making.

CO4: Apply point estimates, interval estimates, and MLE for parameter estimation.

CO5: Evaluate stochastic processes and Markov chain behaviors in AI-related scenarios.

Course Contents

Unit	Description	Duration [Hrs]
I	**Fundamentals of Probability & Random Variables** Sets, events, sample space, mutually exclusive events, independent events, conditional probability, Bayes' theorem, random variables (discrete and continuous), PMF, PDF, CDF, expectation, variance, moments, joint distributions, marginal distributions, conditional distributions, independence of random variables, Markov's inequality, Chebyshev's inequality, Chernoff bounds, Weak Law of Large Numbers, Strong Law of Large Numbers, Central Limit Theorem. **Case Studies (Select any one):** Spam classification using Bayes' theorem, weather prediction using conditional probability, joint probability in manufacturing defect analysis, network traffic modelling using Central Limit Theorem.	10
II	**Probability Distributions** Bernoulli distribution, Binomial distribution, Geometric distribution, Poisson distribution, Poisson process, Uniform distribution, Exponential distribution, Normal distribution, mean and variance of distributions, Introduction of moment generation, applications in AI/ML and queuing systems. **Case Studies (Select any one):**	08

	Call center arrival modelling using Poisson distribution, defect detection in manufacturing using binomial distribution, waiting time analysis using exponential distribution, sensor reading variations modeled using normal distribution.	
III	**Hypothesis Testing** Parameter and statistic, null hypothesis, alternative hypothesis, Type I error, Type II error, significance level, p-value, power of a test, large sample tests (mean, difference of means, proportion, difference of proportions), small sample tests (t-test for mean, t-test for difference of means), chi-square test, F-test for variances, hypothesis testing for real-world decision making. **Case Studies (Select any one):** A/B testing for e-commerce click-through rate improvement, medical data testing for treatment effectiveness, comparison of accuracy between two ML models, evaluating impact of teaching method using student score data.	**10**
IV	**Estimation – Point, Interval & MLE** Point estimation, interval estimation, confidence intervals for mean, confidence intervals for proportion, confidence intervals for binomial, Poisson and normal parameters, properties of estimators (unbiasedness, consistency, efficiency), Maximum Likelihood Estimation, MLE for binomial parameters, MLE for Poisson parameters, MLE for exponential distribution, MLE for normal distribution parameters. **Case Studies (Select any one):** MLE-based click-through rate estimation, estimation of failure rate of electronic components using exponential distribution, estimation of customer arrival rate in retail using Poisson distribution, confidence interval estimation for OTT movie rating averages.	**09**
V	**Stochastic Processes & Markov Chains** Introduction to stochastic processes, branching processes, Markov chains, transition probability matrix, state classification, recurrent states, transient states, absorbing states, stationary distributions, applications of Markov chains in AI, introduction to martingales and stopping times. **Case Studies (Select any one):** Google PageRank using Markov chains, customer loyalty state transition modelling, weather forecasting using Markov model, reinforcement learning grid-world transition modelling.	**08**
	Total	**45**

Text Books:

1. R. A. Johnson, Miller and Freund's "Probability and Statistics for Engineers", Pearson Publishers, 9 th Edition, 2017.
2. John E. Freund, Benjamin M. Perles, "Modern Elementary Statistics", 12th Edition, Pearson, 2013. 3. Hamdy A. Taha, "Operations Research: An Introduction", Pearson, 2017, Tenth Edition.
3. S.C.Gupta and V.K.Kapoor, "Fundamentals of Mathematical Statistics", 12th Edition, S. Chand & Co, 2020.
4. Kantiswarup, P.K.Gupta and Manmohan Singh, "Operations Research", Sultan Chand & Sons, 2014.

Reference Books*:*

1. Sheldon M. Ross : Introduction to Probability and Statistics for Engineers and Scientists Academic Press.
2. A. Papoulis & S. U. Pillai : Probability, Random Variables, and Stochastic Processes McGraw-Hill
3. J. S. Milton & J. C. Arnold : Probability and Statistics in the Engineering and Computer Sciences McGraw-Hill

e-sources:

1. NPTEL – Stochastic Processes (IIT Bombay) https://nptel.ac.in/courses/111102014
2. University of Cambridge – Stochastic Processes Notes https://www.statslab.cam.ac.uk/~rrw1/markov/M.pdf

Program	S.Y. B. Tech. (Open Elective Course-I)					Semester: III	
Course	Probability and Statistics					Code: AIDS25OEC-207	
Credit	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
04	Lecture	Practical	Tutorial	UT	FA	SA	Total
	3	--	01	25	25	50	100

Pre-requisites: Prior knowledge of basic understanding of algebra and arithmetic operations, Fundamental concepts of probability (events, sample space, basic rules) is essential.

Course Objectives: This course aims at enabling students:

1. To introduce the basic concepts of random variables and probability distributions.
2. To develop the ability to apply standard discrete and continuous distributions to real-world problems.
3. To analyze fundamental statistical measures and distribution properties.
4. To provide knowledge of hypothesis testing methods for decision-making.
5. To enable students to analyze real-life situations using statistical reasoning and case studies.

Course Outcomes: After completion, students will be able to:

CO1: Demonstrate understanding of Set Theory concepts and their relevance to probability.
CO2: Interpret random variables**,** probability distribution functions, and basic probability concepts.
CO3: Apply standard discrete and continuous probability distributions (Binomial, Poisson, Uniform, Exponential, and Normal) to solve simple engineering problems**.**
CO4: Analyze statistical measures such as mean, quantiles, and inequalities (Markov and Chebyshev) to study distribution properties.
CO5: Evaluate hypotheses for population parameters and interpret results using real-life case studies**.**

	Detailed Syllabus	
Unit No.	Description	Hours
I	**Introduction to Set Theory** Basics of set Theory: Introduction to sets and algebra of sets, Random Experiment, Sample Space, Events, Complementary Events, Union and Intersection of Two Events, Difference Events, Exhaustive Events, Mutually Exclusive Events, Equally Likely Events, Independent Events. Case Study: Create measures of central tendency for a real-life example dataset, such as the payroll dataset or titanic dataset.	8
II	**Introduction to Probability** Probability Theory: Mathematical & Statistical definition of Probability, Need of probability theory in Data science, Axiomatic definition of probability, Addition Theorem, Multiplication Theorem, Theorems of Probability, Conditional Probability, Inverse Probability, Joint Probability, Total Probability and Bayes Theorem. Case Study: Use of probability in real-life situations, like weather forecasting, sports betting, sales forecasting etc	7
III	**Introduction to Statistics** Introduction, Origin and Development and scope of Statistics, Population and Sample, Sampling –Introduction, Types of Sampling, Purposive Sampling, Random Sampling, Simple Sampling, Stratified Sampling, Parameter and Statistic, Sampling Distribution 54 Sampling with and Without Replacement, Population Parameters,	10

	Sample Statistics. Introduction, Arithmetic Mean, Simple and weighted mean for raw data, Discrete frequency distribution, Continuous frequency distribution, Properties of A. M. Merits & Demerits of A.M. Median, Mode for raw data, Merits and demerits of Median and Mode. Case study: sampling for any real-world problem like exit poll statistics	
IV	**Descriptive Statistics** Measures of Dispersion, Skewness and Kurtosis: Dispersion, Characteristics for an Ideal Measure of Dispersion, Measures of Dispersion, Range, Quartile Deviation, Mean Deviation, Standard Deviation and Root Mean Square Deviation, Coefficient of Dispersion, Coefficient of Variation, Skewness, Kurtosis. Correlation and Regression: Bivariate Distribution, Scatter diagrams, Correlation, Karl Pearson's coefficient of correlation, Rank correlation, Regression, Regression Coefficients, Lines of Regression. Case study: Create measures of dispersion for a real-life example dataset like students dataset, iris detection etc.	**10**
V	**Probability Distributions & Hypothesis Testing** Random Variables: Distribution function, PMF, PDF, basic properties; mean, median, quantiles, Markov and Chebyshev inequalities. Standard Distributions: Bernoulli, Binomial, Poisson, Uniform, Exponential, Normal – definitions and simple applications. Moment concepts (introduction) and basic characteristics of the above distributions. Hypothesis Testing: Statistical hypothesis, null and alternative hypotheses, level of significance, Type I & II errors, tests for mean and proportion. Case study: Based on binomial distribution and hypothesis testing for real-life decision problems.	**10**
	Total	**45**

Text Books:

1. A. M. Mood, F. A. Graybill, D. C. Boes, Introduction to the Theory of Statistics, McGraw-Hill. 3rd Edition
2. Robert V. Hogg, Joseph McKean, Allen T. Craig, Introduction to Mathematical Statistics, Pearson, 8th Edition.
3. S. C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons. 11th Edition

Reference Books:

1. Sheldon Ross, A First Course in Probability, Pearson, 9th Edition
2. William Mendenhall, Statistics for Engineering and the Sciences, CRC Press, 13th Edition
3. J.E. Freund, Mathematical Statistics, Pearson, 7th Edition

e-sources:

1. Probability and Statistics, IIT Kharagpur
   https://nptel.ac.in/courses/111105090
2. Probability and Statistics for Engineers
   https://nptel.ac.in/courses/111102160

Program	S. Y. B. Tech (Open Elective Course-I)			Semester : III			
Course	Numerical Statistical Analysis			Code:	IT25OEC-207		
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
4	3	-	1	25	25	50	100

Pre-requisites: Basic knowledge of Engineering Mathematics, Algebra, Calculus

Course Objectives: This course aims at enabling students

1. To solve algebraic and transcendental equations using numerical methods.
2. To apply interpolation, curve fitting, numerical differentiation, and numerical integration techniques.
3. To analyze probability theory, random variables, and standard probability distributions.
4. To utilize statistical tools for sampling, correlation, regression, and hypothesis testing.
5. To develop analytical skills for engineering problems using numerical and statistical techniques.

Course Outcomes: After completion of the course, the students will be able to:

CO1: Apply numerical techniques to solve algebraic and transcendental equations with convergence analysis.
CO2: Use interpolation, curve fitting, numerical differentiation, and numerical integration effectively.
CO3: Apply probability concepts and standard probability distributions to engineering problems.
CO4: Perform sampling, regression analysis, correlation and statistical data interpretation.
CO5: Conduct hypothesis testing such as t-test, z-test, chi-square, ANOVA & construct confidence intervals.

Course Contents

Unit	Description	Duration [Hrs]
I	**Numerical Solution of Equations** Types of Errors: Absolute, Relative, Percentage error Roots of algebraic & transcendental equations, Bisection Method, Regula Falsi Method, Newton–Raphson Method, Secant Method, Convergence of iterative methods.	9
II	**Interpolation & Curve Fitting** Finite differences**,** Interpolation: Newton Forward & Backward Interpolation, Lagrange's Interpolation**,** Newton's Divided Difference Formula, Curve fitting: Least Squares Method, Fitting Straight Line, Parabola, and Exponential Curves.	9
III	**Numerical Differentiation & Integration** Numerical differentiation using Newton's formulas, Maxima & minima using numerical differentiation, Numerical Integration: Trapezoidal Rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule, Error analysis for numerical differentiation & integration.	9
IV	**Probability & Statistical Distributions** Basic Probability Theory, Bayes' Theorem, Random Variables, Discrete & Continuous Probability Distributions: Binomial Distribution, Poisson Distribution, Normal Distribution, Moments, Skewness & Kurtosis.	9
V	**Sampling, Regression & Hypothesis Testing** Sampling Techniques & Sampling Distribution, Correlation: Karl Pearson coefficient, Regression Analysis: Linear regression &	9

	multiple regression, Hypothesis Testing: t-test, z-test, Chi-square test, ANOVA (One-way), Confidence intervals.	
	Total	**45**

Text Books:

1. S.S. Sastry – Introductory Methods of Numerical Analysis, PHI, 5th edition
2. Erwin Kreyszig – Advanced Engineering Mathematics, Wiley, 10th edition
3. Gupta & Kapoor – Fundamentals of Mathematical Statistics, Sultan Chand, , 11th edition

Reference Books:

1. Jain, Iyengar, Jain – Numerical Methods for Scientific and Engineering Computation, New Age, 6th edition
2. William Navidi – Engineering Statistics, McGraw Hill, 2nd edition
3. Richard Johnson – Statistics & Data Analysis, Pearson, 6th edition

e-sources:

1. NPTEL: Numerical Methods (IIT Bombay / IIT Kharagpur) https://nptel.ac.in/courses/111/102/111102128/

e-Books:

1. https://www.aerostudents.com/courses/applied-numerical analysis/IntroductoryMethodsOfNumericalAnalysis.pdf

Program	S. Y. B. Tech. (Open Elective Course-I)				Semester : III		
Course	Vectors and Transforms				Code:	ETC25OEC-207	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
4	3	-	1	25	25	50	100

Pre-requisites: Univariate and Multivariate Calculus.

Course Objectives: This course aims at enabling students:

1. To develop a strong foundational understanding of transform techniques to analyze and solve engineering and communication-related problems.
2. To Provide conceptual clarity in formulating and solving differential equations arising in various engineering applications.
3. To Equip students with numerical methods for interpolation, numerical integration, and solving ordinary differential equations with practical computational approaches.
4. To Enable students to understand, differentiate, and integrate vector fields, and apply these concepts to engineering and physical systems.

Course Outcomes: After successful completion of the course, learner will be able to:

CO1: Apply transforms such as Laplace transform, to solve problems related to signal processing and control systems.

CO2: Apply Integral transforms such as, Fourier transform to solve problems related to signal processing and control systems.

CO3: Apply transforms such as Z-Transform to solve problems related to signal processing and control systems.

CO4: Obtain Interpolating polynomials, numerically differentiate and integrate functions, numerical solutions of differential equations using single step and multi-step iterative methods used in modern scientific computing.

CO5: Perform vector differentiation and integration, analyze the vector fields and apply to Electromagnetic fields.

Course Contents

Unit	Description	Duration [Hrs]
I	**Laplace Transform** Definition – conditions for existence; Transforms of elementary functions; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n , scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives; Examination of integrals by using Laplace transform; Transforms of some special functions- periodic function, Heaviside unit step function, Dirac delta function.	09
II	**Inverse Laplace Transform** Introductory remarks; Inverse transforms of some elementary functions; General methods of finding inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of linear differential equations.	09

III	**Fourier and Z-Transforms** Fourier Transform (FT): Complex exponential form of Fourier series, Fourier integral representation, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms and their inverses. Z-Transform (ZT): Introduction, Definition, Standard properties, ZT of standard sequences and their inverses, Solution of difference equations	**09**
IV	**Numerical Methods** Interpolation: Finite Differences, Newton's and Lagrange's interpolation formulae, Numerical differentiation. Numerical Integration: Trapezoidal and Simpson's rules, Bound of truncation error. Solution of ordinary differential equations: Euler's method, Modified Euler's method, Runge-Kutta 4th order method, introduction to Predictor-Corrector methods.	**09**
V	**Vector Differential and Integral Calculus** Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities. Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problems in Electro-magnetic fields	**09**
	Total	**45**

Text Books:

1. Higher Engineering Mathematics by B. V. Ramana Tata McGraw Hill, 1st Edition.
2. Advanced Engineering Mathematics by Peter V. O'Neil ,Thomson Learning, 2nd Edition.

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig,Wiley Eastern Ltd., 1st Edition.
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, 2nd Edition.
3. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York, 2nd Edition.
4. Steven C. Chapra, Raymond P. Canale, Numerical Methods for Engineers, 4/e, Tata McGraw Hill Editions, 2002, ISBN 0-07-047437-0
5. Dr. B. S. Garewal, Numerical Methods in Engineering and Science, 7/e, Khanna Publishers, ISBN 81-74009-205-6
6. Thomas' Calculus by George B. Thomas, Addison-Wesley, Pearson, 1st Edition.

e-sources:

1. https://onlinecourses.nptel.ac.in/noc23_ma54/
2. https://nptel.ac.in/courses/111106111

Program	S. Y. B. Tech. (Open Elective Course-I)				Semester : III		
Course	Applied Mathematics				Code		ME25OEC-207
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
4	3	-	1	25	25	50	100

Pre-requisites: Univariate Calculus, Multivariate Calculus

Course Objectives: This course aims at enabling students:

1. To develop conceptual understanding of Laplace Transform techniques and their applications in engineering problems.
2. To impart knowledge of Inverse Laplace Transform methods for solving differential equations and system analysis problems.
3. To introduce Fourier Transform techniques for analysis of signals and systems in the frequency domain.
4. To familiarize students with statistical methods and probability theory for modeling and analysis of engineering data.
5. To provide foundations of vector calculus, including vector fields and their differentiation and integration**,** for engineering applications.

Course Outcomes: After learning the course, the students should be able to:

CO1: Apply transforms such as the Laplace transform to solve problems related to mechanical systems.
CO2: Apply transforms such as the Inverse Laplace transform to solve problems related to mechanical systems, such as Differential Equations, mass, and spring systems.
CO3: Apply Integral transforms, such as the Fourier transform, to solve problems related to mechanical systems
CO4: Apply Statistical methods like correlation and regression in analyzing and interpreting experimental data applicable to reliability engineering and probability theory in testing and quality control.
CO5: Perform vector differentiation and integration, analyze the vector fields and apply to magnetic fields

Course Contents

Unit	Description	Duration [Hrs.]
I	**Laplace Transform** Definition – conditions for existence; Transforms of elementary functions; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives; Examination of integrals by using Laplace transform; Transforms of some special functions- periodic function, Heaviside unit step function, Dirac delta function.	09
II	**Inverse Laplace Transform** Introductory remarks; Inverse transforms of some elementary functions; General methods of finding inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of linear differential equations.	09

III	**Fourier Transforms** Fourier Transform (FT): Complex exponential form of Fourier series, Fourier integral representation, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms, and their inverse Fourier transform, inverse Fourier sine transform, inverse Fourier cosine transform	**09**
IV	**Statistics & Probability** Introduction to Data Science, Measures of central tendency, Measures of dispersion, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation: Karl Pearson's correlation, Spearman's rank correlation, Regression analysis, and Reliability of regression estimates. Probability, Probability density function, and Central limit theorem, Probability distributions: Binomial, Poisson, Normal, and Test of hypothesis: Chi-square test and t- test	**09**
IV	**Vector Differential and Integral Calculus** Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities. Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stokes' theorem. Applications to problems in Electro-magnetic fields	**09**
	Total	**45**

Text Books:

1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw Hill,1st Edition.
2. Advanced Engineering Mathematics by Peter V. O'Neil, Thomson Learning, 2nd edition.

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd., 1st Edition.
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publication, 1st Edition.
3. Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York, 2nd edition.
4. Thomas' Calculus by George B. Thomas Addison-Wesley, Pearson, 1st Edition.
5. Introduction to Probability and Statistics for Engineers and Scientists, 5e, by Sheldon M. Ross.
6. Jason Brownlee, 'Statistical Methods for Machine Learning', Machine learning Mastery, 1st Edition.

e-sources:

1. https://nptel.ac.in/courses/111107098.
2. https://nptel.ac.in/courses/111105041.

Program	S. Y. B. Tech. (Value Education Course-I)			Semester : III			
Course	Universal Human Values			Code		CSE25VEC-208	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	-	2	1	-	-	25	25

Pre-requisites: Social Values, Communication

Course Objectives: The course aims to:

1. To help the students develop a holistic, humane world-vision, and appreciate the essential complementarity between values and skills to ensure mutual happiness and prosperity
2. To elaborate on 'Self-exploration' as the process for Value Education.
3. To facilitate the understanding of harmony at various levels starting from self and going towards family and society.
4. To elaborate on the salient aspects of harmony in nature and the entire existence.

Course Outcomes: Upon successful completion of this course, students will be able to:

CO1. Recognize the concept of self-exploration as the process of value education and see they have the potential to explore on their own right.

CO2. Explore the human being as the coexistence of self and body to see their real needs / basic aspirations clearly.

CO3. Explain relationship between one self and the other self as the essential part of relationship and harmony in the family.

CO4. Interpret the interconnectedness, harmony and mutual fulfilment inherent in the nature and the entire existence and draw ethical conclusions in the light of Right understanding

Course Contents

Unit	Description	Duration [Hrs]
I	**Introduction to Value Education** Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity - the Basic Human Aspirations and their Fulfilment, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity - Current Scenario, Method to Fulfil the Basic Human Aspirations	4
II	**Harmony in the Human Being** Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to Ensure self-regulation and Health	4
III	**Harmony in the Family and Society** Harmony in the Family - the Basic Unit of Human Interaction "Trust' - the Foundational Value in Relationship, 'Respect' - as the Right Examination, Values in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order	4
IV	**Harmony in the Nature (Existence)** Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence,	3

	Professional Ethics in the light of Right Understanding, Strategies for Transition towards Value-based Life and Profession	
	Total	**15**

The subject instructor supposed conduct the activities based on the topic covered during the tutorial sessions. The few activities should be individual or in group. The students supposed to submit the properly written documents.

Sl. No.	**Suggested List of Experiments/Assignments (Minimum 8 to be performed)**
1	Introduce yourself in detail. What are your life goals? How do you make goals for your life? How do you distinguish between right and wrong? What are your major accomplishments and faults in life? Observe and study them
2	Man-made issues such as energy and material resource depletion, pollution, global warming, ozone depletion, deforestation, and soil degradation pose a threat to the survival of life on Earth. What is the source of these ailments and what is the solution, in your opinion?
3	There is rapidly growing danger due to nuclear proliferation, arms race, terrorism, breakdown of relationships, generation gap, depression, and suicidal attempts. What do you think is the root cause of these threats to human happiness and peace? What is the solution in your opinion?
4	Our "Natural Acceptance" ability allows us to choose what is right or wrong for ourselves. We are not educated to listen to our "Natural Acceptance," which can be confused by perceptual biases and sensory stimuli. Explore the following: (i) What is your natural level of respect for yourself and others? (ii) What is "naturally acceptable" to you: nurturing or exploiting others? Is your lifestyle consistent with your natural acceptance or divergent from it?
5	Share a personal experience when you demonstrated deliberate devotion to values in a challenging scenario
6	Identify any two major problems confronting society now and investigate the underlying causes. Can these be handled based on natural acceptance of human values? If so, how should one move in this approach given the current situation?
7	Having awareness about nature, its four orders and their mutual fulfillment. Activities to be performed- written assignment, chart making.
8	List down all your desires, observe whether the desire is related to Self (I) or Body. If it appears to be related to both, see which part of it is related to Self (I) and which part is related to Body.
9	Form small groups in the class and in that group initiate dialogue and ask the eight questions related to trust. The eight questions are: 1a. Do I want to make myself happy? 2a. Do I want to make the other happy? 3a. Is the other want to make him happy? 4a. Is the other want to make me happy? Intention (Natural Acceptance) 1b. Am I able to make myself always happy? 2b. Am I able to make the other always happy? 3b. Is the other able to make him always happy? 4b. Is the other able to make me always happy? What is the answer? Competence

	Let each student answer the questions for himself and everyone else. Discuss the difference between intention and competence. Observe whether you evaluate your intention & competence as well as the others' intention & competence.
10	1. Observe on how many occasions you are respecting your related ones (by doing the right Examination) and on how many occasions you are disrespecting by way of under- Examination, over-Examination or otherwise Examination. 2. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.
11	Write a note in the form of story, poem, skit, essay, narration, dialogue to educate a child. Evaluate it in a group. Develop three chapters to introduce social science-its need, scope and content in the primary education of children
12	List down units (things) around you. Classify them in four orders. Observe and explain the mutual fulfilment of each unit with other orders. List what do you take from nature; and what do you give back to nature? Are you a source of harmony in Nature?

Text Books:

1. A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, GP Bagaria, 3rd revised edition, UHV Publications, 2023, ISBN: 978-81-957703-7-3 (Printed Copy), 978-81-957703-6-6 (e-book)
2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, GP Bagaria, 3rd revised edition, UHV Publications, 2023, ISBN: 978-81-957703-5-9 (Printed Copy), 978-81-957703-0-4 (e-Book)

Reference Books:

1. Nagaraj, 1999, Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amarkantak,1st Edition.
2. P. Banerjee, 2005, Foundations of Ethics and Management, Excel Books, 1st Edition.
3. N. Tripathy, 2003, Human Values, New Age International Publishers, 1st Edition.
4. E. G. Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers , Oxford University Press, 1st Edition.

E-Sources: Jeevan Vidya: Ek Parichaya — A. Nagaraj (1999)
Link- https://uhvparivar.org/publications/otherbooks/Jeevan-Vidya-ek-Parichay.pdf

E-Books: A Foundation Course in Human Values and Professional Ethics
Link- https://uhvparivar.org/publications/uhvbooks/UHV-FCV-3E-Textbook.pdf

MOOC / NPTEL/YouTube Links:

1. Swayam Course on "Understanding Human Being Nature and Existence Comprehensively" by Dr. Kumar Sambhav
   https://onlinecourses.swayam2.ac.in/aic22_ge23/preview
2. NPTEL Course on "Exploring Human Values: Visions of Happiness and Perfect Society" by Prof. A. K. Sharma IIT Kanpur
   Link- https://nptel.ac.in/courses/109104068
3. YOUTUBE: UHV Lecture Series – Prof. R. R. Gaur
   Link- https://www.youtube.com/playlist?list=PLz0n_SjOttT0LlwM1zVfPVTz3wGM5seXm

Program	S. Y. B. Tech. (Value Education Course-I)			Semester: III			
Course	Professional Ethics for Engineers			Code:		ETC25VEC-208A	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	-	2	1	-	-	25	25

Pre-requisites: Basic understanding of the engineering profession and its societal role

Course Objectives: This course aims at enabling students:

1. To provide the students an understanding of the meaning of ethics in engineering profession.
2. To introduce an awareness of ethical duties and responsibilities of engineers in the practice of them Careers.
3. To provide a sociological understanding of the social impact of technology and engineering.
4. To examine some of the classical cases as well as contemporary ethical issues in engineering Profession.

Course Outcomes: After completion of course, the students will be able to:

CO1**:** Practice the moral values that ought to guide the Engineering profession.

CO2: Discover of the set of justified moral principles of obligation, ideals that ought to be endorsed by the engineers and apply them to concrete situations.

CO3: Know the definitions of risk and safety also discover different factors that affect the perception of risk.

CO4: Appreciate the Ethical issues and Know the code of ethics adopted in various professional bodies and industries.

Course Contents

Unit	Description	Duration [Hrs]
I	**Ethics in Engineering** Understanding basic concepts Ethics- Engineering Ethics- Engineering as Profession – Difference between occupation and professions- Professional Ethics - Codes of Ethics in Engineering profession- Moral dilemmas and moral autonomy in Engineering profession.	4
II	**Engineering as Social Experimentation** Engineering as Experimentation-Engineers as responsible Experimenters-A balanced outlook on Law.	3
III	**Social Impact of Technology and Engineering** Ethics of science and engineering- Ethical leadership in engineering and society, social responsibility of scientist/ researchers, Intellectual property and society, Cross cultural issues in engineering research.	4
IV	**Major Issues in Engineering Ethics and Environment** Ethics and sustainable engineering- Computer ethics- Analyzing ethical problems in research- Ethics in collaborative research- Engineers as expert consultants and advisors- Corporate Social Responsibility (CSR).	4
	Total	15

Course Contents	
Sl. No.	**Suggested List of Experiments/Assignments (Minimum 8 Practical to be Performed)**
1	Study of basic ethical concepts including values, morals, rights, duties, and ethical reasoning frameworks relevant to engineering practice.
2	Study of engineering as a profession with emphasis on professional roles, responsibilities, accountability, and distinction between occupation and profession.
3	Study of professional ethics and codes of ethics as prescribed by recognized professional engineering bodies, highlighting ethical conduct and compliance.
4	Study of moral dilemmas in engineering practice through case studies to develop ethical reasoning and decision-making skills.
5	Study of engineering as social experimentation focusing on risk, safety, uncertainty, and the responsibility of engineers as responsible experimenters.
6	Study of law and ethics in engineering practice to understand regulatory compliance and the need for a balanced ethical and legal outlook.
7	Study of social, environmental, and sustainability impacts of technology and engineering in the context of societal well-being..
8	Study of research ethics and intellectual property rights including issues related to plagiarism, authorship, innovation, and societal benefit.
9	Study of computer ethics and ethics in collaborative engineering work covering data privacy, cybersecurity, and professional integrity.
10	Study of corporate social responsibility (CSR), ethical leadership, and sustainable practices in engineering organizations.

Text books:

1. Naagarazan, R. S., “Professional Ethics and Human Values “New age International, 3rd Edition.
2. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall 4th edition.

Reference Books:

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice all of India, New Delhi, 2004, 1st Edition.
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics - Concepts and Cases", Wadsworth Thompson Learning, United States, 2000, 2nd Edition.
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003, 4th Edition.

e-sources:

1. https://youtu.be/ag1fHF7aL0A?si=vlNPA0Ea7ZjKAT3S
2. https://youtu.be/ag1fHF7aL0A?si=_T2VV3q_iYG4rj8L

Program	S. Y. B. Tech. (Value Education Course-I)			Semester: III			
Course	Social Connect and Responsibility			Code:	ETC25VEC-208B		
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	-	2	1	-	-	25	25

Course Objectives: This course aims at enabling students:

1. To enable the student to do a deep drive into societal challenges being addressed by NGO(s), social enterprises & The government and build solutions to alleviate these complex social problems through immersion, design & technology.
2. To provide a formal platform for students to communicate and connect with their surroundings.
3. To enable to create of a responsible connection with society.

Course Outcomes: After completion of the course, the student will be able to:

CO1: Perform tree plantation and adoption activities and document plant characteristics, relevance, and cultural significance.

CO2: Demonstrate understanding of local heritage and crafts through field visits and digital documentation.

CO3: Explain principles of organic farming and wet waste management and relate them to sustainable campus practices.

CO4:Analyze water conservation practices in community settings and prepare evidence-based documentation.

CO5:Explore and document local culinary heritage, indigenous materials, and food lore through field-based interactions.

Course Contents

The course is mainly activity-based and will offer a set of activities for the students that enable them to connect with fellow human beings, nature, society, and the world at large. The course will engage student interactive sessions, open mic, reading groups, storytelling sessions, and semester-long activities conducted by faculty mentors. In the following set of activities planned for the course have been listed:

Unit	Description	Duration [Hrs]
I	**Plantation and adoption of a tree** Plantation of a tree that will be adopted for four years by a group of B. Tech. students. They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature. carried out by the project groups.	3
II	**Heritage walk and crafts corner** Heritage tours, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsmen, photo blog and documentary on evolution and practice of various craft forms.	3
III	**Organic farming and waste management** Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus	3

IV	**Water Conservation** knowing the present practices in the surrounding villages and implementation in the campus, documentaries or photo blogs presenting the current practices.	**3**
V	**Food Walk** City's culinary practices, food lore, and indigenous materials of the region used in cooking	**3**
	Total	**15**
Course Contents		
Sl. No.	**Suggested List of Assignment/Experiments**	
1	**Tree Plantation & Adoption Activity** Students will plant a sapling on campus or a designated location and adopt it for four years. They must record initial environmental conditions, plant type, and growth indicators.	
2	**Documentary/Photo Blog on Adopted Plant** Each group will prepare a short documentary or a photo blog about the adopted tree covering: • Plant origin • Botanical features • Usage in daily life Cultural, folklore, and literary significance	
3	**Heritage Walk Documentation** Students will participate in a heritage walk within the city to study historical sites, traditional architecture, and community spaces. They will document observations with photographs and short descriptions.	
4	**Crafts Corner Study & Documentation** Visit a local crafts workshop (e.g., pottery, weaving, metalwork) to interact with craftsmen and understand techniques, tools, and cultural relevance. Prepare a photo blog or documentary on evolution and practice of the craft.	
5	**Organic Farming Exposure Visit** Students will visit an organic farm or agricultural field to learn about: • Organic farming techniques • Soil preparation • Bio fertilizers • Crop rotation • Pest control methods A reflective report will be prepared based on observations.	
6	**Wet Waste & Compost Management Practical** Study wet waste collection, segregation, and composting processes in nearby villages or campus. Students will carry out small-scale composting using daily biodegradable waste.	

7	**Water Conservation Practices Survey** Survey nearby villages/campus to document traditional and modern water conservation practices such as: • Rainwater harvesting • Check dams • Greywater reuse • Percolation pits Prepare a photo blog or documentary presenting current practices and recommendations.
8	**Food Walk & Culinary Culture Mapping** Conduct a food walk to explore local dishes, ingredients, indigenous cooking materials, and culinary traditions. Students will document: • History behind specific dishes • Food lore Traditional preparation methods

Textbooks:

1. Agricultural Sustainability: Strategies for Organic, Climate-Smart, and Resource-Conserving Farming, Shravanthi et al., First edition, 2025.
2. Hydrological Measurements for Watershed Research – Wasi Ullah et al., First Edition.
3. Perspectives in Environmental Studies – Kaushik & Kaushik, First Edition,2018.

e-sources:

1. https://www.youtube.com/watch?v=iaQjEDYyWKw
2. https://onlinecourses.nptel.ac.in/noc23_hs155/preview

Program	S. Y. B. Tech. (E and TC)				Semester: III		
Course	Electronic Measurement Tools and Techniques Lab				Code	ETC25VSEC-209 A	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	-	4	-	-	25	25	50

Pre-requisites: Basic knowledge of Electrical and Electronics fundamentals, Familiarity with semiconductor devices, Exposure to digital electronics basics

Course Objectives: This course aims at enabling students:

1. To train students in the operation of electronic testing and measurement instruments.
2. To provide hands-on practice in testing, calibration, and troubleshooting of circuits.
3. To develop skills in data acquisition, waveform analysis, and performance validation.
4. To Prepare learners for industry roles in electronics testing, maintenance, and quality assurance.

Course Outcomes: After learning the course, the students should be able to:

CO1: Operate basic and advanced electronic measurement devices safely and effectively.
CO2: Perform accurate measurements of voltage, current, resistance, frequency, and waveforms.
CO3: Calibrate and troubleshoot circuits using oscilloscopes, signal generators, and analyzers.
CO4: Document and interpret measurement results for design validation and industry applications.

Sl. No.	Suggested List of Experiments/Assignments
1	Use of digital multimeter (DMM) for voltage, current, resistance, and continuity checks
2	Measurement of passive component values (resistors, capacitors, inductors) using handheld LCR meter
3	Measurement on Oscilloscope: operation — time base, triggering, probes
4	Measurement of AC/DC signals, waveforms, rise/fall times
5	Signal generator usage — sine, square, triangular waveforms
6	Frequency response analysis using spectrum analyzer
7	Noise and distortion measurement in amplifier circuits
8	Phase and time delay measurement in communication circuits
9	Calibration of measurement instruments (multimeter, oscilloscope)
10	Troubleshooting faulty circuits using measurement devices
11	Embedded system testing with logic analyzer and protocol analyzer
12	**Mini-Project:** Build and test a prototype circuit (e.g., sensor interface, audio amplifier) using measurement tool.

Reference Books:

1. Electrical Measurements and Instrumentation by Bakshi & Bakshi (2nd Edition)
2. Electronic Instrumentation and Measurements (3rd Edition) by David A. Bell
3. Modern Electronic Instrumentation and Measurement Techniques, (4th Edition)
4. Principles of Electrical Measurement by Alan S. Morris (3rd Edition)

Program	S. Y. B. Tech. (E and TC)				Semester: III		
Course	Programming Foundations Laboratory				Code	ETC25VSEC-209 B	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	-	4	-	-	25	25	50

Pre-requisites: Fundamentals of Programming Languages, Basics of C Programming.

Course Objectives: This course aims at enabling students:

1. To Understand fundamental programming concepts along with core Object-Oriented principles such as classes, objects, inheritance, abstraction, and polymorphism.
2. To Gain in-depth knowledge of essential data structures including arrays, linked lists, stacks, queues, trees, and graphs and apply them to solve computational problems.
3. To Analyze and compare algorithms using time and space complexity, and select efficient solutions for real-world applications.
4. To Design and implement modular, reusable, and scalable software systems using OOP concepts and appropriate data structures.
5. To Apply algorithmic techniques such as searching, sorting, hashing, and graph traversal using industry-relevant programming languages.
6. To Enhance problem-solving skills and software development practices by incorporating UML, debugging methodologies, and design patterns.

Course Outcomes: After learning the course, the students should be able to:

CO1: Demonstrate understanding of object-oriented programming concepts and fundamental data structures for software development.
CO2: Select and apply appropriate data structures and algorithms to solve computational and real-world problems efficiently.
CO3: Design modular and reusable software systems using OOP principles such as encapsulation, inheritance, abstraction, and polymorphism.
CO4: Analyze and evaluate algorithm performance using time and space complexity to compare solution alternatives.
CO5: Implement software solutions using OOP languages by integrating searching, sorting, hashing, trees, and graph algorithms.
CO6: Apply debugging strategies, UML modeling, and documentation standards to develop maintainable and scalable applications.

Course Contents

Sl. No.	Suggested List of Experiments/Assignments (Minimum 16 to be performed)
	Data Structures and Algorithms lab Group A: (Minimum 8 to be performed)
1	**Student Database Management** You are developing a student result management system. The database should support updating records, adding new entries, searching for specific students, and sorting based on performance. Using an array of structures, implement a student database with attributes: roll no, name, program, course, subject marks, total, and average. Support operations: dis- play, search, and sort. (Students can additionally perform modify, append.)
2	**Stack or Queue using Array (Static Implementation)**

	Simulate a parcel handling system at a post office where packages are stacked (LIFO) or queued (FIFO). Use an array to implement a stack (push, pop, display) or a queue (add, delete, display). Choose the appropriate model based on the scenario.
3	**Singly Linked List Operations** You are building a text editor where lines of text are stored dynamically. You need to allow insertion and deletion of lines at any position, and display text both normally and in reverse. Use a singly linked list to implement: display, insert (front/end/middle), delete (front/end/middle), display in reverse, and reverse the list.
4	**Binary Search Tree Operations** An online directory system uses a BST to keep names in a sorted manner and support fast searching. Create a binary search tree and implement recursive traversals (inorder, preorder, postorder) and search for a specific name in the directory.
5	**Graph Traversal** You are designing a navigation system for a campus with multiple buildings. The system should explore possible paths (routes) using BFS or DFS. Create a graph using an adjacency matrix and implement Breadth-First Search and Depth-First Search to explore the building connectivity.
7	**Write a program in C to display the following patterns like** Right-angle triangle with number: Diamond shape with numbers: Pyramid with an asterisk: Pyramid using with a the alphabet: 1 1 * A 12 2 2 * * A B A 123 3 3 3 * * * A B C B A 1234 4 4 4 4 * * * * A B C D C B A 3 3 3 2 2 1
8	**Searching Techniques** You are building a contact manager app. A user wants to search for a contact either by scanning one by one or by using a fast lookup if the list is sorted. Write a program that locates a specific name using both sequential and binary search techniques.
9	**Sorting Algorithms** An online store wants to sort its product prices to help customers compare them easily. Choose suitable sorting techniques for small to medium datasets. Implement bubble sort, selection sort, and insertion sort to reorder product prices.
10	**Stack or Queue using Linked List (Dynamic Implementation)** Design a service window system where customers arrive and are served in order (FIFO), or a browser history system where the last visited page is accessed first (LIFO). Use a linked list to implement a dynamic stack (push, pop, display) or queue (add, delete, display) based on the given use case.

10	**Balanced Parentheses or Decimal to Binary** Write a program to check for balanced parentheses in a given expression (including (), {}, []) using a stack implemented with arrays or linked lists. **OR** Write a program to convert a Decimal number to a binary number using a stack.
11	**Height and Depth in BST** Develop a program that constructs a Binary Search Tree and computes the height of the tree and the depth of a given node.
12	**Count and Classify Nodes** Write a program to count the number of: • Leaf nodes • Internal nodes • Nodes with only one child in a given binary tree.
13	**Train Ticket Booking System:** Implement a system to manage train ticket bookings using queues. Confirm bookings if seats are available; otherwise, add passengers to a waiting list. On cancellation, shift the first waiting passenger to confirmed **status.**

Sl. No.	**Suggested List of Experiments/Assignments**
	Java Programming lab Group A: (Minimum 8 to be performed)
1.	**Class and Objects:** Write a program in C++ to perform following operations on complex numbers Add, Subtract, Multiply, Divide, Complex conjugate. Design the class for complex number representation and the operations to be performed
2.	**Java Basics:** Write a program in Java to find all the roots of a quadratic equation.
3.	**Methods:** Write a program in Java using methods 1. To find factorial of a given n umber. 2. To display first 50 prime numbers. 3. To find sum and average of N numbers.
4.	**Constructor:** Create a Bank Account class with deposit, withdraw, and balance check functionalities...
5.	**Arrays & Strings:** Write a program in Java to sort List of Integers List of Names
6.	**2 dimensional Arrays:** Write a Program in Java to add two matrices...

7.	**Inheritance:** Create a base class Employee and derived classes Manager, Developer with overridden salary computation
8.	**Interface:** Implement a program using interfaces such as Vehicle with classes Car, Bike..
9.	**Abstract Class:** Demonstrate an example where both abstract class and interface are used in a payment gateway context.
10.	**Exception:** Write a program in JAVA using try and catch for exception handling. Create a program to validate voter age using user-defined exceptions.
11.	**Threads:** Write a program to create multiple threads and demonstrate how two threads communicate with each other

Reference Books:

1. Reema Thareja, Data Structures using C, Oxford University Press, 2nd Edition.
2. Yedidyah Langsam, Moshe J Augenstein and Aaron M Tenenbaum Data structures using C and C++ PHI Publications, 2nd Edition.
3. E Balagurusamy, "Programming with C++", Tata McGraw Hill, 3rd Edition.
4. E Balagurusamy, Programming with JAVA , Tata McGraw Hill, 6th Edition.

Program	S. Y. B. Tech. (Entrepreneurship Management Course)				Semester: III		
Course	Principles of Management and Entrepreneurship				Code		IL25EMC-210
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	-	2	1	-	-	25	25

Pre-requisites: Prior knowledge of Engineering Environment, Communication Skills, Mathematical and Analytical Skills are essential.

Course Objectives: This course aims at enabling students:

1. To introduce the fundamental concepts, functions, and principles of management
2. To develop the ability to plan, organize, lead, and control organizational activities
3. To familiarize with the concept of entrepreneurship
4. To develop skills for identifying business opportunities
5. To create awareness about MSME policies, institutional support systems, startup ecosystem

Course Outcomes: After learning the course, the students should be able to:

CO1: Explain fundamental principles, functions of management with the role and responsibilities of manager.

CO2: Design and develop the plan, strategies, organizational structure and HR processes.

CO3: Apply motivational theories for leadership in organizational situations

CO4: Identify entrepreneurial traits and competencies

CO5: Create the opportunities to Utilize government and financial support systems through business plans.

Course Contents

Unit	Description	Duration [Hrs]
I	**Theory of Management** Meaning, Nature, Scope and Importance of Management, Functions of Management – Planning, Organizing, Staffing, Directing, Controlling, Levels of Management – Top, Middle and Lower, Roles of a Manager (Mintzberg's Managerial Roles), Evolution of Management Thought: Classical Theory (Fayol, Taylor), Behavioral Approach, Modern Approaches (System, Contingency), Social and Ethical Responsibilities of Managers.	03
II	**Planning and Techniques in Management** Planning – Nature, Process, Types of Plans, MBO (Management by Objectives), Decision Making – Types, Steps, Techniques, Organizing – Concept, Types of Organization Structures (Functional, Divisional, Matrix), Span of Control, Delegation of Authority, Centralization vs Decentralization, Staffing – Manpower Planning, Recruitment, Selection and Training	03
III	**Leadership and Control** Leadership – Meaning, Importance, Qualities of a Leader, Leadership Styles – Autocratic, Democratic, Laissez-faire, Transformational, Motivation – Meaning, Importance, Motivation Theories – Maslow, Herzberg, McGregor Theory X & Y, Communication – Process, Types, Barriers, Effective Communication Techniques, Controlling – Concept, Steps, Techniques of Control, Budgetary and Non-Budgetary Controls.	03
IV	**Introduction to Entrepreneurship and Business Plan**	06

	Concept and Meaning of Entrepreneurship**,** Characteristics and Competencies of Successful Entrepreneurs**,** Types of Entrepreneurs – Innovative, Imitative, Serial, Social, Women Entrepreneurs**,** Entrepreneurial Process – Idea Generation to Enterprise Launch**,** Creativity and Innovation – Techniques and Tools**,** Barriers to Entrepreneurship – Personal, Social, Situational. Micro, Small & Medium Enterprises (MSMEs) – Definition, Importance, Opportunities, Business Environment – Internal & External Factors, Market Survey, Feasibility Study & Project Identification, Business Plan Preparation & Project Report Components. & External Factors, Market Survey, Feasibility Study & Project Identification, Business Plan Preparation & Project Report Components. Institutional Support for Entrepreneurship: MSME-DI, DIC, NSIC, SIDBI, NABARD, KVIC, NIESBUD, EDII, Start-up India, Make in India, Atal Innovation Mission. Financial Support: Seed Funding, Angel Investors, Venture Capital, Bank Loans	
	Total	**15**

Learning Resources

Text Books:

1. Stephen Robins, Mary Coulter, David Decenzo. Fundamental of Management, 11th Edition, Pearson, 2020, ISBN 13: 978-0-13-517515-6
2. Richard L. Hughes, Robert C. Ginnett, Gordon J. Curphy. Leadership, 09th Edition, Mc Graw Hill, 2022, ISBN-13. 978-9355320704
3. Bygrave, W.D., Zacharakis, A., & Corbett, A.C. Entrepreneurship, 6th Edition, Wiley, 2025. ISBN: 9781394262809.

Reference Books:

1. Jennifer M. George. Contemporary Management, 1st Edition, Mc Graw Hill, 2024, ISBN13: 9781264948390
2. Ries, Eric. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create
3. Radically Successful Businesses, 1st Edition, Crown Business, 2011. ISBN: 9780307887894.
4. Osterwalder, Alexander & Pigneur, Yves. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, 1st Edition, Wiley, 2010. ISBN: 9780470876411.

MOOC / NPTEL/YouTube Links: -

1. https://www.coursera.org/learn/entrepreneur-guide-beginners
2. https://onlinecourses.nptel.ac.in/noc21_mg70/preview
3. https://onlinecourses.nptel.ac.in/noc20_ge08/preview

Sl. No.	Suggested List of Experiments/Assignments
1	Case Study on Functions of Management in a Real-World Organization
2	Preparation of Vision, Mission, and Objectives for a Startup Idea
3	Case Study on Evolution of Management Thought – Classical to Modern Approaches
4	Case Study on Motivation Strategy Development for Employee Productivity Improvement
5	Business Communication Activity – Drafting Official Letters, Memos, and Emails
6	Decision-Making Exercise Using Decision Tree or SWOT Analysis
7	Preparation of a Basic Business Plan for a Startup

8	Market Survey and Opportunity Identification for New Ventures
9	Preparation of Project Report for an Entrepreneurial Idea
10	Group Activity: Role Play on Leadership and Team Management

Course Syllabus
Semester-IV

Program	S. Y. B. Tech. (E and TC)				Semester : IV		
Course	Electrical Networks and Machines				Code:	ETC25PCC-251	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites: Basic Electricity and Magnetism Concepts

Course Objectives: This course aims at enabling students:

1. To develop a strong understanding of fundamental circuit laws and network theorems for effective analysis and design of electrical networks.
2. To enable students to analyze and predict the transient and steady-state behavior of AC and DC electrical circuits using appropriate mathematical tools.
3. To equip students with the ability to evaluate performance parameters and operational efficiencies of transformers and AC machines through theoretical and practical approaches.
4. To provide knowledge on the construction, operation, and performance characteristics of DC machines, enhancing practical understanding of their working principles.

Course Outcomes: After successful completion of the course, learner will be able to:

CO1: Apply circuit laws and network theorems to analyze electrical networks.
CO2: Analyze transient and steady-state response of AC and DC circuits.
CO3: Evaluate performance parameters of transformers and AC machines.
CO4: Develop an understanding of the construction, operating characteristics, and performance of DC machines.

Course Contents

Unit	Description	Duration [Hrs]
I	**Network Theorems** Basic Concepts and Circuit Elements, Active and passive elements, independent and dependent sources Energy, power, and Kirchhoff's laws (KCL and KVL) , Basic nodal and mesh analysis, super node and super mesh analysis, source transformation, superposition, Thevnin's, Norton's and maximum power transfer theorem and useful circuit analysis techniques**.**	**08**
II	**Transient Analysis and Frequency Domain Analysis** Transient Response, Behavior of R-L, R-C, and R-L-C circuits with DC excitation Time constants and steady-state conditions, AC fundamentals, AC Analysis and Frequency Response, Sinusoidal steady-state analysis, Concept of impedance, admittance, and phasor representation, Resonance in series and parallel circuits, Q-factor, and bandwidth, Two-Port Network Parameters, Z, Y, h, and transmission (ABCD) parameters and their interrelations.	**08**
III	**Transformers and AC Machines** Working principle of transformer, classification, brief description of each part its function and material used, Single-Phase Transformer: Construction, working, EMF equation, voltage ratio, current ratio, transformation ratio, kVA rating of transformer and losses in transformer, Regulation and efficiency, open and short circuit tests, Three-Phase Induction Motor: Construction, working principle, types (squirrel cage and slip ring), Torque-slip characteristics, starting methods, and speed control, Synchronous Machines (Introduction):	**07**

	Principle of operation, construction, and applications.	
IV	**DC Machines** Review of force on current carrying conductor, Flemings left hand rule, Construction and Working Principle (motor & generator), Parts of DC machines, types, and their functions, EMF equation of DC Machine (motor and generator), Types and its characteristics of DC machines (motor and generator), Back EMF, starters of dc machine, Speed control of DC motor Breaking of DC motor, Applications of DC machines (motor and generator), Stepper motor- types, principle of working and applications, Servo motor - types, principle of working and applications.	**07**
	Total	**30**

Text Books:

1. N. J. Nagrath and M. Gopal, Control System Engineering, New Age International Publishers, 5th Edition.
2. K. Ogata, Modern Control Engineering, Prentice Hall India Learning Private Limited; 5th Edition.

Reference Books:

1. Benjamin C. Kuo, Automatic control systems, Prentice Hall of India, 7th Edition.
2. M. Gopal, Control System Principles and Design, Tata McGraw Hill, 4th Edition.

e-sources:

1. NPTEL Course Control System https://nptel.ac.in/courses/107/106/107106081/
2. NPTEL Course Control System Design https://nptel.ac.in/courses/115/108/ 115108104/

Program	S. Y. B. Tech. (E and TC)				Semester : IV		
Course	Signals and Systems				Code:	ETC25PCC-252	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites: Basics of Mathematics: Integration, Differentiation

Course Objectives: This course aims at enabling students:

1. To analyze the mathematical representation of continuous and discrete time signals and systems.
2. To classify signals and systems into different categories.
3. To analyze Linear Time Invariant (LTI) systems in time and transform domains.
4. To build basics for understanding of courses such as signal processing, control system and communication.

Course Outcomes: After successful completion of the course, learner will be able to:

CO1: Identify, classify basic signals and perform operations on signals.

CO2: Identify, Classify the systems based on their properties in terms of input output relation and in terms of impulse response and will be able to determine the convolution between to signals.

CO3: Analyze and resolve the signals in frequency domain using Fourier series and Fourier Transform.

CO4: Resolve the signals in complex frequency domain using Laplace Transform and will be able to apply and analyze the LTI systems using Laplace Transforms.

Course Contents

Unit	Description	Duration [Hrs]
I	**Introduction to Signals and Systems** Signals: Introduction, Graphical, Functional, Tabular and Sequence representation of Continuous and Discrete time signals. Basics of Elementary signals, Operations on signals, Communication, control system and Signal processing examples. Classification of signals, Systems: Introduction, Classification of Systems: Lumped Parameter and Distributed Parameter System, static and dynamic systems, causal and non-causal systems, Linear and Non- linear systems, time variant and time invariant systems, stable and unstable systems, invertible and non- invertible systems.	08
II	**Time domain representation of LTI System** Input-output relation, definition of impulse response, convolution sum, convolution integral, computation of convolution integral using graphical method for unit step to unit step, unit step to exponential, exponential to exponential, unit step to rectangular and rectangular to rectangular only. Computation of convolution sum. Properties of convolution. System interconnection, system properties in terms of impulse response, step response in terms of impulse response.	08
III	**Fourier Series** Fourier series (FS) representation of periodic Continuous Time (CT) signals, Dirichlet condition for existence of Fourier series, Amplitude and phase response, FS representation of CT signals using trigonometric and exponential Fourier series. Applications of Fourier series, properties of Fourier series and their physical significance, Gibbs phenomenon.	07

IV	**Laplace Transform** ROC, Properties of ROC, Laplace transform of standard periodic and aperiodic functions, properties of Laplace transform and their significance, Laplace transform Examination using properties, Inverse Laplace transform based on partial fraction expansion, stability considerations in S domain**.**	**07**
	Total	**30**

Text Books:

1. Simon Haykins and Barry Van Veen, "Signals and Systems", Wiley India, 2nd Edition.
2. P. Ramesh Babu, R Anandanatarajan, "Signals and Systems", Scitech, 5th Edition.
3. Shaila D. Apte, "Signals and Systems, Principals and Applications", Cambridge University Press 2016,1st Edition.

Reference Books:

1. M.J. Roberts "Signal and Systems", Tata McGraw Hill 2007, 1st Edition.
2. A. Nagoor Kanni "Signals and Systems", McGraw Hill, 2nd Edition.

e-sources:

1. https://nptel.ac.in/courses/108/104/108104100/
2. http://www.nptelvideos.in/2012/12/signals-and-system.html

Program	S.Y. B. Tech. (E&TC)			Semester : IV			
Course	Signals and Systems Lab			Code:		ETC25PCC-253	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	-	4	-	50	-	25	75

Pre-requisites: Basics of Computer, Basics of Mathematics

Course Objectives: This course aims at enabling students:

1. To analysis of elementary signals and their applications.
2. To study stability of system using pole zero plot
3. To perform and interpret basic signal operations to understand real-world signal behavior**.**

Course Outcomes: After learning the course, the students should be able to:

CO1: Simulate elementary signals using MATLAB
CO2: Analyze signals with the help of Fourier analysis.
CO3: Perform spectral analysis of real time signals.
CO4: Verify Properties of Convolution Integral.

Course Contents

Sl. No.	Suggested List of Experiments /Assignments (Minimum 8 to be performed)
1	Generate and plot the following signals in time domain and also sketch its amplitude and phase spectrum. Verify the result: Impulse, Unit Step, Exponential, Unit ramp, Sinc, Rectangular.
2	Write the codes to plot the following signals also simulate the signals: (a)Sin (200π t) (b) sin (200πt+ π/6) (c) sin (200πt - π/6) (d) cos(200 π t) (e) cos(200 π t+ π/4) (f) cos(200 π t-π/6)
3	Develop codes to simulate, and plot the results for an exponential signal: x(t) = k e –at u(t) for the cases: (a) k= 1, and a = 0.35 (b) k = 1.2 and a =0.45
4	Consider various human voice / speech (probably your voice both male and female) or music signals. Try different sampling rates and observe the effect of aliasing.
5	The speech signal has frequency components in the audio frequency range 300 Hz to 3400 Hz of the electromagnetic spectrum. Record the male and female voice speech Signal. Write a program to record the speech signals and sketch it in time domain, its amplitude spectrum and phase spectrum.
6	The music signal has frequency components in the audio frequency range 20 Hz to 20000 Hz of the electromagnetic spectrum. Record or use recorded music samples of different instruments (at least four) and Write a program to record the music signal and sketch it in time domain, its amplitude spectrum and phase spectrum. Also comment on the result.
7	Find the convolution integral of Unit step and exponential signals and write a program to sketch the out response of the system. Also verify the commutative property of convolution integral.

8	Take any one periodic signal and find its Fourier series coefficients using exponential or trigonometric FS method. Write a program to find its Fourier series coefficients. Also using FS coefficients, reconstruct the signal. Observe the effect of Gibbs phenomenon.
9	Find Laplace Transform of standard signals. Check ROC and comment on stability.
10	Perform inverse Laplace transform using partial fractions. Study system stability using pole-zero plots.

Reference Books:

1. Simon Haykins and Barry Van Veen, "Signals and Systems", Wiley India, 2nd Edition.
2. Luis F. Chaparro, "Signals and Systems using Matlab", Word Press, 3rd Edition.

Program	S. Y. B. Tech. (E and TC)				Semester : IV		
Course	Communication Systems				Code:	ETC25PCC-254	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites: Basic concepts of Electronics Engineering

Course Objectives: This course aims at enabling students:

1. To equip/ familiarize students with basic fundamentals of communication systems.
2. To acquaint the students with the principles of modulation process and different amplitude and angle modulation systems.
3. To introduce the students with the concept of Sampling theorem and pulse modulation techniques and PCM, DM and ADM.

Course Outcomes: After learning the course, the students should be able to:

CO1: Analyze the fundamentals of communication systems.

CO2: Apply amplitude modulation and demodulation techniques to analyze AM system performance.

CO3: Apply frequency modulation and demodulation techniques to analyze FM system performance.

CO4: Exhibit the importance of Sampling Theorem and correlate with Pulse Modulation techniques (PAM, PWM, and PPM)

Course Contents

Unit	Description	Duration [Hrs]
I	**Fundamentals of Communication System** Introduction to Communication System, Block Diagram of Communication System, Types of Communication System, Classification of signals Regenerative repeaters, Types of Noise, Signal-to-Noise Ratio (SNR) Noise Calculations, Concept of baseband and band pass signals, Signal Energy and Energy Spectral Density, Signal Power and Power Spectral Density	08
II	**AM Transmission & Reception** Base band & Carrier communication ,Need of Modulation, Amplitude Modulation (AM), Types of AM, Calculation of modulation index for AM wave, Modulation index for more than one modulating signals, Spectrum of AM, Double Sideband Suppressed Carrier (DSB-SC) Modulation, Single Sideband Modulation (SSB), Vestigial Sideband Modulation (VSB), , Power and power efficiency Envelope Detection, AM receiver.	08
III	**FM Transmission and Reception** Concept of Angle modulation, Modulation index, Bandwidth, frequency spectrum of Frequency Modulation(FM) & Phase Modulation(PM) Narrow band & wide band FM, Bessel's Function and its mathematical analysis, Generation of FM (Direct & Indirect Method), Comparison of FM and PM. FM generation by Armstrong's Indirect method, frequency multiplication and application to FM, FM demodulator.	08

IV	**Pulse Modulation** Need of analog to digital conversion, Sampling theorem in time domain, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect. Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM) and Pulse Position Modulation (PPM), Data formats and its Properties, Type of Quantization: Uniform & Non-Uniform Quantization, Quantization error, Concept of Companding, Generation & Reconstruction of PCM, Delta Modulation, Adaptive Delta Modulation. Scrambling & Unscrambling.	**08**
	Total	**30**

Text Books:

1. Taub, Schilling and Saha, Principles of Communication Systems, McGraw-Hill, 4th Edition.
2. B P Lathi, Zhi Ding, Modern Analog and Digital Communication System, Oxford University Press, 4th Edition.

Reference Books:

1. Bernard Sklar and Prabitra Kumar Ray, Digital Communications Fundamentals and Applications, Pearson Education 2nd Edition.
2. Wayne Tomasi, Electronic Communications System, Pearson Education, 5th Edition.
3. A.B Carlson, P B Crully and J C Rutledge, Communication Systems, Tata McGraw Hill Publication, 5th Edition. 4. Simon Haykin, Communication Systems, John Wiley & Sons, 4th Edition.
4. George Kennedy and Bernard Davis, Electronic Communication System.
5. P. Chakrabarti, Analog and Digital Communication.

e-sources:

1. https://nptel.ac.in/courses/108/104/108104091/

Program	S. Y. B. Tech. (E and TC)			Semester : IV			
Course	Communication Systems Lab			Code:		ETC25PCC-255	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	-	4	-	25	-	25	50

Pre-requisites : Basics of Modulation Techniques

Course Objectives: This course aims at enabling students:

1. To familiarize students with Amplitude &Frequency modulation techniques used in Analog communication systems.
2. To introduce the students with the concept of Sampling & Digital Modulation techniques.
3. To develop students with tools required for performance analysis of digital communication systems.

Course Outcomes: After learning the course, the students should be able to:

CO1: Implement AM and FM techniques for different modulation signals for calculating Modulation index and BW.
CO2: Verify Sampling Theorem and Generation and Detection of PWM using IC 555.
CO3: Implement various digital modulation techniques: PCM.
CO4: Implement various digital modulation techniques: DM and ADM
CO5: Implement various Line codes with their spectrums.
CO6: Simulate different digital modulation tech with case study.

Course Contents

Sl. No.	Suggested List of Experiments/Assignments (Minimum 9 to be performed)
	Group A: Hardware Practical (Minimum 5 to be performed)
1	AM Generation (DSB-FC): Calculation of modulation index by graphical method, Power of AM Wave for different modulating signal and Observe Spectrum.
2	Frequency modulator & demodulator using Varicap/Varactor Diode and NE 566 VCO, IC 565 (PLL based detection), calculation of modulation index & BW of FM.
3	Verification of Sampling Theorem in time domain (Flat top & Natural sampling).
4	Generation and Detection of PWM using IC 555
5	Study of PCM
6	Study of DM: Generation and detection
7	Study of ADM: Generation and detection
8	Study of line codes (NRZ, RZ, POLAR RZ, BIPOLAR (AMI), MANCHESTER) & their spectral analysis.
	Group B: Software Practical (Minimum 3 to be performed)
1	Write a program to Verify Sampling Theorem
2	Write a program to calculate Signal to noise ratio for PCM system & DM system.
3	Write a program to demonstrate PCM companding.

4	Simulation program to study effect of ISI and noise in baseband communication system.
5	Case Study any one: using Simulation Software (e.g., MATLAB/Simulink or SDR kits) 1. Two-Way Radio Communication (Walkie-Talkies) 2. FM Radio Broadcasting 3. Television System. 4. Aviation Communication System
	Group C: Experiential Learning (Minimum 1 to be performed)
1	Project based Learning / Poster Presentation (Choose one communication application and present the system architecture.)
2	Industrial Visit Write a report on Industrial Visit
3	Survey related any communication system.

Reference Books:

1. Bernard Sklar and Prabitra Kumar Ray, Digital Communications Fundamentals and Applications, Pearson Education 2nd Edition.
2. Wayne Tomasi, Electronic Communications System, Pearson Education, 5th Edition.

Program	S. Y. B. Tech. (E and TC)				Semester : IV		
Course	Database Management Systems				Code:	ETC25MDM-256	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites: Data Structures

Course Objectives: This course aims at enabling students:

1. To analyze fundamental concepts of database from its design to its implementation.
2. To manipulate database using SQL Query to create, update and manage Database.
3. To familiar with the basic issues of transaction processing and concurrency control.
4. To learn and understand Parallel Databases and its Architectures.

Course Outcomes: After successful completion of the course, learner will be able to:

CO1: Design and implement a database schema for a given problem-domain using data model.

CO2: Formulate, using SQL/DML/DDL commands, solutions to a wide range of query and update problems.

CO3: Implement transactions, concurrency control, and be able to do Database recovery.

CO4: Analyze various Parallel Database Architectures and its applications, Distributed Databases and its applications.

Course Contents

Unit	Description	Duration [Hrs]
I	**Introduction to DBMS** Introduction to Database Management Systems, Purpose of Database Systems, Database-System Applications, Data Abstraction and Database System Structure. Relational Model: Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries, tuple relational calculus. Entity-Relationship model: Basic Concepts, Entity Set, Relationship Sets and Weak Entity Sets, Mapping Cardinalities, Keys, E-R diagrams, Design Issues, Extended E-R Features, Converting E-R & EER diagram into tables.	8
II	**Relational Database Design** Basic concepts, CODD's Rules, Relational Integrity: Domain, Referential Integrities, Enterprise Constraints, Database Design: Features of Good Relational Designs, Normalization, Atomic Domains and First Normal Form, Decomposition using Functional Dependencies, Algorithms for Decomposition, 2NF, 3NF, 4NF and BCNF.	8
III	**Basics of SQL and Transactions Management** DDL, DML, DCL, Structure: Creation, Alteration, defining constraints – Primary key, Foreign key, Unique key, Not null, Check, IN operator, Functions - Aggregate Functions, Built-in Functions –Numeric, Date, String Functions, Set operations, sub-queries, correlated subqueries, Use of group by, having, order by, join and its types, Exist, Any, All, view and its types. Transaction control commands: Commit, Rollback, Save-point PL/SQL Concepts: Cursors, Stored Procedures, Stored Function, Database Triggers. Transactions Management	7

	Basic concepts of a Transaction, Transaction Management, Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non-recoverable Schedules, Concurrency Control: Need, Locking Methods, Deadlock handling and Time-stamp based Protocols.	
IV	**Introduction to Database Architectures** Multi-user DBMS Architectures, Case study- Oracle Architecture. Parallel Databases: Performance Parameters for Parallel Databases, Types of Parallel Database Architecture, Evaluating Parallel Query in Parallel Databases and Virtualization on Multicore processors. Distributed Databases: Distributed Database Management System, Factors Encouraging DDBMS, Advantages of Distributed Databases, Types of Distributed Databases, Architecture of Distributed Databases, Distributed Database Design, Distributed Data Storage, and Distributed Transaction: Basics, Failure modes, Commit Protocols, Concurrency Control in Distributed Database.	**7**
	Total	**30**

Text Books:

1. Silberschatz, H.F. Korth and S. Sudarshan , "Database System Concepts", McGraw Hill, 6th Edition.
2. C.J. Date, A. Kannan, S. Swamynathan "An introduction to Database Systems", Pearson, 8th Edition.

Reference Books:

1. Martin Gruber, "Understanding SQL", Sybex Publications 1st Edition.
2. Ivan Bayross, "SQL- PL/SQL", BPB Publications, 4th Edition.
3. S.K. Singh, "Database Systems: Concepts, Design and Application", Pearson, Education, 2nd Edition.

e-sources:

1. https://nptel.ac.in/courses/106/106/106106220/

Program	S.Y. B. Tech. (Open Elective Course-II)			Semester : IV			
Course	Digital Marketing			Code:		CE25OEC-257	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites: General awareness of marketing terms such as target audience, branding, product and pricing

Course Objectives: This course aims at enabling students

1. To Provide the basic Concepts of Digital marketing and the road map for successful Digital marketing strategies.
1. To know the importance of Social Media Platforms importance in Digital Marketing.
2. To understand the technological importance of Search Engine Optimization (SEO).
3. To develop skills for creating, managing, and optimizing digital marketing campaigns across various channels.
4. To enable students to analyze digital consumer behavior and create effective online strategies.

Course Outcomes: After completion of the course, the students will be able to:

CO1: Explain the basic Concepts of Digital marketing

CO2: Apply digital marketing tools for suitable applications

CO3: Examine the various social media and design Advertising campaigns

CO4: Apply SEO, SEM, and content creation techniques to improve online visibility.

Course Contents

Unit	Description	Duration [Hrs]
I	**Introduction to Digital Marketing** Fundamentals of Digital marketing & Its Significance, Traditional marketing Vs Digital Marketing, Evolution of Digital Marketing, Digital Marketing Landscape, Key Drivers, The Digital users in India, Digital marketing Strategy- Consumer Decision journey Digital advertising Market in India, Skills in Digital Marketing, Digital marketing Plan. Case study: Launching a Tech Startup's Mobile App-"Smart Budget".	8
II	**Digital Marketing strategy** Strategy used in Digital Marketing, PPC and online marketing through social media, Social Media Marketing, Google web-master and analytics overview, Email Marketing, Mobile Marketing Display adverting, Buying Models, different type of ad tools, Display advertising terminology, types of display ads, different ad formats Case study: Social Media Marketing	8
III	**Social Media Marketing** Fundamentals of Social Media Marketing& its significance, Necessity of Social Media Marketing Facebook Marketing: Facebook for Business, Facebook Insight, Different types of Ad formats, setting up Facebook Advertising Account, Facebook audience & types, Designing Facebook Advertising campaigns, Facebook Avatar, Apps, Live, Hashtags Case study: App Store Optimization (ASO)	7

IV	**Search Engine Optimization (SEO)** Introduction to SEO, How Search engine works, SEO Phases, History of SEO, How SEO Works, Googlebot (Google Crawler), Types of SEO technique, Keyword Planner tools Social media Reach- Video Creation & Submission, Maintenance- SEO tactics, Google search Engine Case study: Provide REAL outputs like a mini-project Marketing plan, Keyword research sheet Google Ads mock screenshot FB Ads audience design Social media creative poster 1 reel script	**7**
	Total	**30**

Text Books:

1. Dave Chaffey & Fiona Ellis-Chadwick, "Digital Marketing", 8th Edition, Pearson, 2022, ISBN: 9781292738086.
2. Rajan Gupta & Supriya Madan, "Digital Marketing", 8th Edition , Dreamtech Press, 2023, ISBN: 9789355511522.

Reference Books:

1. Jain, Iyengar, Jain – Numerical Methods for Scientific and Engineering Computation, New Age, 7th Edition
2. William Navidi – Engineering Statistics, McGraw Hill,3rd Edition.
3. Richard Johnson – Statistics & Data Analysis, Pearson,2nd Edition.

e-sources:

1. https://youtu.be/-5q7RB1GWEA

Program	S. Y. B. Tech. (Open Elective Course-II)			Semester : IV			
Course	Engineering Economics			Code:		ETC25OEC-257	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites: Basic Knowledge of economics and mathematics.

Course Objectives: This course aims at enabling students:

1. To enable the students to understand the economic theories which may be applied to maximize return and the economic environment in which they have to operate.
2. To introduce fundamental economic principles relevant to engineering analysis and decision-making.
3. To develop the ability to apply time-value-of-money concepts for evaluating engineering alternatives.
4. To understand cost estimation, depreciation, and break-even analysis for effective financial planning in engineering projects.

Course Outcomes: After completion of the course, the students will be able to:

CO1: Identify the core concepts of economics and recognize its potential in addressing modern day socio- economic challenges

CO2: Compare and analyze alternatives based on present, annual, rate of return, benefit over cost analyses, time value of money in Examination of investments and projects in real life and the impact of economic factors on feasibility of real life projects.

CO3: Analyze and predict the economic impact of engineering solutions to make financially prudent decisions in everyday life.

CO4: Evaluate the role of economics to give knowledge to the students about various costs for determining the manufacturing of a product.

Course Contents

Unit	Description	Duration [Hrs]
I	**Introduction** Nature and significance of economics, Goods and Utility, Basic Concept of Demand and Supply, Elasticity of Demand- Price elasticity of Demand, Cross elasticity of Demand, Production - Production Function, Production Process and Factors of Production, Market - Introduction to Monopoly, Perfect Competition, Oligopoly and Monopolistic Competition, Cost Concepts, E-commerce.	8
II	**Money- its Examination and function, Bank** Commercial Bank and Central Bank and brief idea about function of banking system. Tax and Subsidy, Type of Tax- Direct and Indirect, Monetary and fiscal policy, Inflation and Business cycle, IPR & WTO, International trade, terms of Trade, Gain from International Trade, Free Trade vs. Protection, Dumping, and Balance of Payment	8
III	**Role of Science, Engineering and Technology In economic Development** Some of the burning problems of rural and slum areas in India and how engineering and technology may be used to alleviate them, example of Green	7

	Revolution and White revolution. Reasons for their success and can we replicate them. Sustainable Development	
IV	**Elementary Economic Analysis; Interest formulas and their Applications** Calculations of economic equivalence, Bases for Comparison of Alternatives: Present Worth Method, Future worth method, Annual equivalent, Internal Rate of return; Evaluating Production Operations, Business Risk Management.	**7**
	Total	**30**

Text Books:

1. A Textbook of Engineering Economics: The Principles and Applications, D. R. Kiran, BS Publications, 2021, 1st Edition.
2. Engineering Economics Test & Cases, D N Dwivedi, Dr. H L Bhatia & Dr. S N Maheshwari, Vikas Publishing House Pvt. Ltd. Revised / Latest Edition (2024).

Reference Books:

1. Principles of Engineering Economics with Applications, Zahid A. Khan, Arshad N. Siddiquee, Brajesh Kumar, Mustufa H. Abidi, 2nd Edition, Cambridge University.
2. Practical Applications of Engineering Economics, Kal R. Sharma, Momentum Press. Engineering Economics, R. Panneerselvam, PHI Learning Private Ltd, 1st Edition.

e-sources:

1. https://youtu.be/-5q7RB1GWEA

Program	S. Y. B. Tech. (Open Elective Course-II)			Semester: IV			
Course	Digital Finance			Code:		ME25OEC-257	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites: Basic Finance and Economics

Course Objectives: This course aims at enabling students

1. To understand the evolution of digital finance and the role of big data in modern financial systems.
2. To gain insight into digital payment ecosystems and ongoing transformations in digital banking.
3. To acquire foundational knowledge of blockchain technology, cryptocurrencies, and decentralized finance.
4. To explore applications of artificial intelligence, machine learning, and data analytics in financial services.

Course Outcomes: On completion of the course, students will be able to –

CO1: Explain the basics of digital finance, big data, and regulatory frameworks.
CO2: Analyze digital payments, Fin Tech trends, and neo-banking models.
CO3: Illustrate block chain, cryptocurrencies, and DeFi systems.
CO4: Discuss the role of AI/ML for financial analytics.

Course Contents

Unit	Description	Duration [Hrs]
I	**Digital Finance Fundamentals and Big Data** Evolution & Fundamentals of Digital Finance: Evolution of digital finance and the shift from traditional to digital systems. Introduction to FinTech and technological transformations in financial services. Overview of regulatory frameworks and compliance in the digital era. The Rise of Big Data in Finance: Role of big data in shaping financial decision-making and risk management. Leveraging data science for personalization and modern financial services Case Study: DBS Bank's Digital Transformation	7
II	**Digital Payment Systems & Digital Banking Transformation** Digital Payment Ecosystems: Historical evolution and digitalization of payment systems (ECS, RTGS, NEFT, IMPS, UPI, mobile wallets, contactless payments), Attributes of a well-functioning payment system and the role of banks. Fintech Innovations & Disruption: FinTech startups, challenger banks, and peer-to-peer lending models, FinTech applications across banking, NBFCs, insurance, lending, audit, and compliance, Regulatory guidelines (e.g., RBI guidelines) and risks associated with new payment models. The Future of Digital Banking: How traditional banks are adapting and the rise of neo-banks, Digital banking trends and evolving customer expectations Case Study**:** Unified Payments Interface (UPI) in India.	7
III	**Blockchain, Cryptocurrencies & Decentralized Finance** Blockchain Technology: Fundamentals of blockchain and underlying cryptographic techniques, Smart contracts and decentralized finance (DeFi) applications.	8

	Cryptocurrencies & Digital Assets: Overview and evolution of cryptocurrencies (Bitcoin, Ethereum, etc.), Central Bank Digital Currencies (CBDCs) and other emerging digital assets. Advanced Applications & Case Studies: Impact of blockchain on payments, lending, and financial settlements, Real-world case studies and disruptive potential in global finance Case study: The Sand Dollar (Bahamas' CBDC)	
IV	**Artificial Intelligence, Machine Learning in Financial Analytics** AI & Machine Learning in Finance: Predictive analytics in stock markets, trading, and algorithmic/high frequency trading, Credit risk analysis and automated decision-making using AI. Data Analytics & Financial Applications: Data sourcing, cleaning, processing, and visualization for financial data, Sentiment analysis and AI-driven portfolio management. Practical Projects & Case Studies: Hands-on projects: building stock price prediction models, fraud detection systems, and credit score prediction models, Real-world applications in digital lending and wealth management Case study: Thread programming Using Pthreads, POSIX	**8**
	Total	**30**

Text Books:

1. C. Skinner, Digital Finance: Big Data, Startups, and the Future of Financial Services, 1st edition. Hoboken, NJ, USA: Wiley, 2016.
2. J. H. M. T. Jeffry, Introduction to FinTech, 1st edition. Noida, India: Pearson Publications, 2018
3. D. Tapscott and A. Tapscott, The Blockchain Revolution: How the Technology Behind Bitcoin and Other Cryptocurrencies is Changing the World, 1st edition. New York, NY, USA: Penguin Random House, 2016.
4. M. López de Prado, Machine Learning for Asset Managers, 1st edition. Cambridge, UK: Cambridge University Press, 2020.
5. "FinTech: The Impact and Role of Financial Technology" by Parag K. Patel, Wiley publications, 1st edition

Reference Books:

1. R. Ghose, Future Money: Fintech, AI and Web3. London, UK: Kogan Page, 2024.
2. Y. Hilpisch, Artificial Intelligence in Finance: A Python-Based Guide, 1st edition. Sebastopol, CA, USA: O'Reilly Media, 2020.
3. M. López de Prado, Advances in Financial Machine Learning, 1st edition. Hoboken, NJ, USA: Wiley, 2018.
4. S. Chishti and J. Barberis, The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs, and Visionaries, 1st edition. Hoboken, NJ, USA: Wiley, 2016.
5. D. Drescher, Blockchain Basics: A Non-Technical Introduction in 25 Steps, 1st edition. Berkeley, CA, USA: Apress, 2017.
6. B. Hines, Digital Finance: Security Tokens and Unlocking the Real Potential of Blockchain, 1st edition. Hoboken, NJ, USA: Wiley, 2020

E- Books:

1. P. H. Beaumont, Digital Finance: Big Data, Start-ups, and the Future of Financial Services, 1st edition. London, U.K.: Routledge, 2019. Link: https://download.e-bookshelf.de/download/0015/1963/23/L G-0015196323-0047264745.pdf
2. N. Urbach and M. Roglinger, Big Data and Artificial Intelligence in Digital Finance, 1st edition. Cham, Switzerland: Springer, 2022 Link: https://library.oapen.org/bitstream/id/fefe46c7-4495 49ba-bcab-9cf1851e81e6/978-3-030-94590-9.pdf
3. L. Perlman, An Introduction to Digital Financial Services, 1st edition., 2018. Link: https://www.academia.edu

MOOC/NPTEL/YouTube Links:

1. https://www.my-mooc.com/en/mooc/introduction-to-fintech/
2. https://mooc.besideproject.eu/courses/blockchain-use-cases-in-digital-finance/
3. https://www.coursera.org/specializations/digital-transformation-financial-services

Program	S. Y. B. Tech. (Value Education Course-II)			Semester: IV			
Course	Indian Constitution			Code		CE25VEC-258	
Credit	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	1	-	1	-	-	25	25

Pre-requisites: Knowledge of Indian history, civics, and societal structure to comprehend constitutional principles and governance frameworks is essential.

Course Objectives: This course aims at enabling students:

1. To acquaint the students with legacies of constitutional development in India and help those to understand the most diversified legal document of India and philosophy behind it.
2. To make students aware of the theoretical and functional aspects of the Indian Parliamentary System.
3. To channelize students' thinking towards basic understanding of the constitutional principles and statutory institutions.
4. To enable students to critically evaluate constitutional provisions and apply them to contemporary social, political, and administrative contexts.

Course Outcomes: After learning the course, the students should be able to:

CO1: Identify and explore the basic features and modalities about Indian constitution.

CO2: Differentiate and relate the functioning of Indian Parliamentary System at the center and state level.

CO3: Analyze the administrative structure of various branches of government.

CO4: Examine different aspects of Indian Legal System and its related bodies.

Course Contents

Unit	Description	Duration [Hrs]
I	**Introduction to Constitution** Meaning & Constitutionalism, Introduction to Constitution: Meaning of the constitution law and constitutionalism, making of constitution, Salient features and characteristics of the Constitution of India, Preamble, Fundamental Rights, Directive Principles of State Policy, Fundamental Duties and itslegal status, Citizenship. Case Study: The Kesavananda Bharati Case (1973) – Basic Structure & Constitutionalism	4
II	**System of Government- Center and State level and local level** Structure and Function of Central Government, President, Vice President, Prime Minister, Cabinet, Parliament, Supreme Court of India, Judicial Review, Federal structure, and distribution of legislative and financial powers between the Union and the States, local self-government. Case Study : S.R. Bommai v. Union of India (1994) – Misuse of President's Rule	4
III	**Government: Union and State** Executive & Legislature, composition, powers and functions, Local Self Governments – Panchayat Raj Institutions & Urban Local Bodies (Municipalities).	4

	Statutory Institutions: Elections-Election Commission of India, National Human Rights Commission, National Commission for Women Case Study: Indira Gandhi v. Raj Narain (1975) – Executive Accountability(Powers of Election Commission, Executive accountability, Free & fair elections)	
IV	**Constitution Functions** Indian Federal System and its characteristics, Federal structure & distribution of legislative and financial powers between the Union and the States. Centre & State Relations, President's Rule, Constitutional Amendments and powers, Constitutional Functionaries, Emergency Provisions, Assessment of working of the Parliamentary System in India. Case Study : GST & Federal Structure (2017–2023)	**3**
	Total	**15**

Text Books:

1. Durga Das Basu, —Introduction to the Constitution of India —, Prentice Hall of India, New Delhi,24th edition,2020, ISBN-109388548868.
2. Clarendon Press, Subhash C, Kashyap, — Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 5th edition, 2014, ISBN-9781107034624.

Reference Books:

1. Maciver and Page, —Society: An Introduction Analysis — Laxmi Publications, 4th edition, 2007, ISBN-100333916166.
2. PM Bhakshi, —The constitution of India||, Universal Law Publishing - An imprint of Lexis Nexis, 14th edition,2017, ISBN-108131262375.
3. Indian Constitution by Subhash C. Kashyap, National Book Trust, New Delhi.
4. Constitution of India and Professional Ethics, Dr. G. B. Reddy & Mohd. Suhaib, Dreamtech Press..

e-sources:

1. Updated 2024 edition (English + Hindi Diglot) — PDF version. S3WaaS
2. Official publication with all amendments (as on May 2022) — PDF version. S3WaaS
3. A simple introductory book: The Constitution of India — An Introduction (by NCERT) — which gives a good basic overview. NCERT
4. Constitution Law and Public Administration in India (NPTEL-NOC, IIT Madras) — comprehensive course covering constitutional law + public administration. NPTEL Online Courses+2NPTEL+2

Program	S. Y. B. Tech. (Value Education Course-II)			Semester: IV			
Course	Environmental Science			Code	AIDS25VEC-258		
Credit	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	1	-	1	-	-	25	25

Pre-requisites: Prior knowledge of Multidisciplinary nature of environmental studies; components of environment — atmosphere, hydrosphere, lithosphere and biosphere.is essential.

Course Objectives: This course aims at enabling students:

1. To gain an understanding of the Environment where we live
2. To comprehend the importance of water
3. To educate about Air and Noise pollution
4. To explain the concepts of E- waste and Green Computing

Course Outcomes: After successful completion of the course, learner will be able to:

CO1: Analyze the impacts of different types of environmental pollution on ecosystems and physical resources.

CO2: Describe the sources and effects of water, air, and noise pollution on human health and the environment.

CO3: Identify sources and types of e-waste and analyze basic e-waste management practices.

CO4: Apply green computing principles to promote environmental sustainability and reduce ecological impact.

Course Contents

Unit	Description	Duration [Hrs]
I	**Environmental pollution** Environment and its importance, Definition, Types. Effect of environmental pollution on Plants, Non-living things.	3
II	**Water Pollution** Definition, Sources of water Pollution, Types of waste Water-Domestic and industrial waste	4
III	**Air pollution** Definition, Sources/causes of air pollution. Atmospheric layers, Effects on human. **Noise Pollution:** Definition of Noise Pollution, Types of Noise Pollution	4
IV	**E-waste management** Definition of E-waste, Sources of E-waste, Types of E-waste **Green computing**: Definition, Objectives of Green Computing, Necessity, Environmental benefits	4
	Total	15

Tutorial Conduction and Term work Guidelines (Set of Suggested Activities)

1	Report/Presentation on the effect of Environmental Pollution on any world famous Structure/ monument.

2	Report/Presentation on importance of different sources of water available nearby them.
3	Report/Presentation based on the data collected from the local authorities on air pollution and noise pollution.
4	Report/Presentation on the E-Waste generated in the campus.
5	Time-series analysis of natural resource consumption of a given country using publicly available data

Text Books:

1. Bharucha, E., textbook of "Environmental Studies", University Press (2005), ISBN-10:8173715408, 3rd Edition.
2. "The text book of Environmental studles", Dr. P. D. Raut, Shivaji University, 2013,2nd Edition.
3. "A Text Book of Environmental Studies", Dr. D. K. Asthana, S. Chand, 2nd Edition
4. "Environmental Pollution, monitoring and control", S. M. Khopkar, New Age Publication, 2nd Edition.

Reference Books

1. Bharucha, E., —Textbook of Environmental Studies||, Universities Press (2005), ISBN-10:8173715408 ,1st Edition.
2. Mahua Basu, —Environmental Studies||, Cambridge University Press, ISBN-978-1-107-5317-3, 1st Edition.

e-sources:

1. https://onlineethics.org/cases/life-and-environmental-science-ethics-case-studies.

Program	S. Y. B. Tech. (E and TC)			Semester : IV			
Course	Community Engagement Project			Code			ETC25ELC-259
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	-	4	-	-	50	-	50

Pre-requisites: Basic understanding of social and ethical responsibilities, Teamwork and communication skills acquired in prior coursework or group activities, Familiarity with problem-solving methodologies and project planning, Conversation in local language.

Course Objectives: This course aims at enabling students:

1. To Establish a mutually beneficial relationship between the college and the community.
2. To opportunities to engage with their local community, fostering empathy, teamwork, and problem solving skills while contributing positively to their surroundings.
3. To understanding of the challenges faced by the local community and the role of engineering in addressing those challenges.
4. To apply technical knowledge and skills to design solutions or interventions that create a positive impact on the community.
5. To evaluate and critically analyse the outcomes of their engagement activities, deriving actionable insights for sustainable impact.

Course Outcomes: After learning the course, the students should be able to:

CO1: Identify and Analyze local community needs and challenges by engaging with stakeholders and evaluating real-world problems.

CO2: Design and Implement practical, creative, and context-specific solutions using engineering principles to address community issues.

CO3: Reflect and evaluate the effectiveness of their interventions and articulate lessons learned through reports and presentations.

Course Contents

Implementation	• A group of 3 to 4 students could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay/college premise. • Each group /practical batch is allotted to a faculty member of the department as a mentor. • A division of 60 students can have 3 batches of minimum 20 students. Practical load of 4 hours to be allocated to each batch. • The group of students will be associated with a government official / village authority /NGOs etc. concerned, allotted by the district administration, during the duration of the project. • The Community Engagement Project should be different from the regular programmes of NSS/NCC /Green Club/Hobby Clubs, Special Interests Groups etc • An activity book has to be maintained by each of the students to record the activities undertaken/involved and will be countersigned by the concerned mentor/HoD. • Project report shall be submitted by each student/group of students. • An internal Examination shall also be conducted by a committee constituted by the HoD. Examination to be done based on the active participation of the student and marks could be awarded by the mentor/HoD. • Students groups can conduct an awareness programme on Health and Hygiene or in Organic Farming or in Fisheries or in advocating prohibition of liquor or about renewable energy, ewaste management or any other activity in an area of their studies and as per his/her aptitude.

	• Oral Examination shall consist of presentation and demonstration of the project work carried out by the project groups.
Suggestive list of topics under Community Engagement Project	• The below lists are not exhaustive and open for HoD's or mentors to add, delete or modify. It is expected that the focus should be on specific local issues in their nearby areas. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a student/group of students shall • Use/ miss-use of cell phones • Career orientation of youth • Water facilities and drinking water availability • Health and hygiene of the school going students, home makers and old personals • Health intervention and awareness programmes • Horticulture • Herbal and Nutrition • Traditional and Modern health care methods • Food habits 44 • Air /Sound /Water pollution • Plantation and Soil protection • Renewable energy and Solar Systems • Yoga awareness and practice • Health care awareness programmes and their impact • Organic farming • Food adulteration • Incidence of Diabetes and other chronic diseases • Blood groups and blood levels • Chemicals in daily life • Music and dance • Women education and empowerment
Project Scope	• Conduct workshops or awareness drives on topics like digital literacy, environmental sustainability, mental health, or career planning for local stakeholders. • Develop a simple prototype or solution that addresses a real-world problem (e.g., a water-saving device, simple mobile apps, or tools for community use). • Organize clean-up drives, tree plantations, recycling campaigns, or energy conservation initiatives. • Promote health through awareness programs on hygiene, nutrition, and exercise. • Teach basic computer or technical skills to students, staff, or the community
Proposal Submission	CEP Group Should Submit a two-page project proposal, preferably prior to the term commencement outlining the following: - • Title of the project • Aim, Objective and expected outcome • Plan of execution (timeline and activities). • Place of the CEP and involvement of any local authority, NGP • Required resources (if any). • Get approval from the designated faculty mentor.

Text Books:

1. Waterman, A. Service-Learning: A Guide to Planning, Implementing, and Assessing Student Projects. Routledge, 1997.
2. Beckman, M., and Long, J. F. Community-Based Research: Teaching for Community Impact. Stylus Publishing, 2016. 3. Design Thinking for Social Innovation. IDEO Press, 2015.
3. Dostilio, L. D., et al. The Community Engagement Professional's Guidebook: A Companion to The

Community Engagement Professional in Higher Education. Stylus Publishing, 2017.

MOOC / NPTEL/YouTube Links:

1. NPTEL course: Ecology and Society, https://onlinecourses.nptel.ac.in/noc20_hs77/preview.

Web Links:

1. UNESCO: Education for Sustainable Development https://www.unesco.org.
2. EPICS (Engineering Projects in Community Service) https://engineering.purdue.edu/EPICS.
3. Ashoka: Innovators for the Public https://www.ashoka.org.
4. Design for Change https://www.dfcworld.com.

Program	S. Y. B. Tech. (Entrepreneurship Management Course)				Semester : IV		
Course	Entrepreneurship Skills Development				Code	IL25EMC-260	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	-	2	1	-	-	25	25

Pre-requisites: Prior knowledge of Engineering Environment, Communication Skills, Mathematical and Analytical Skills are essential.

Course Objectives: This course aims at enabling students

1. To Introduce the fundamental principles of entrepreneurship, forms of business organizations, and the start-up ecosystem.
2. To Enable students to identify, evaluate, and select viable business opportunities using structured techniques.
3. To Familiarize students with business models, financial planning, and market validation strategies.
4. To Expose students to key marketing strategies, customer acquisition techniques, and branding essentials for start-ups.
5. To Develop students' entrepreneurial mind-set and their ability to communicate and pitch business ideas effectively using structured storytelling techniques.

Course Outcomes:

After learning the course, the students should be able to:

CO1: Describe the role of entrepreneurship in economic growth and the startup ecosystem.

CO2: Apply creative techniques to viable business ideas based on customer needs.

CO3: Develop a basic business model using tools like the Business Model Canvas through market research.

CO4: Implement basic marketing strategies for start-ups.

	Detailed Syllabus	
Unit	Description	Duration [Hrs]
I	**Introduction to Entrepreneurship** Entrepreneurship: Definition and evolution, Role of entrepreneurship in economic development, Role in job creation, GDP, and innovation. Characteristics of an Entrepreneur: Key traits: Risk-taking, innovation, pro-activeness, Leadership, perseverance, and resilience. Types of Entrepreneurships: Startup entrepreneurship, Social entrepreneurship, Intrapreneurship (corporate entrepreneurship), Lifestyle and small business entrepreneurship, Forms of Business Organization – Sole proprietorship, partnership, private limited, public limited. Entrepreneurial Mindset: Growth mindset and adaptability, Creativity and problem-solving, Opportunity recognition and initiative-taking. Overview of the Startup Ecosystem: Key stakeholders: Incubators, accelerators, angel investors, VCs, Government support schemes (Startup India, Atal Innovation Mission, etc.), Global vs. Indian startup ecosystems	3

II	**Idea Generation & Opportunity Recognition** Creativity Techniques for Idea Generation: Definition and importance of creativity in entrepreneur- ship. Brainstorming: Rules of effective brainstorming. Individual vs. group brainstorming. Mind Mapping: Visual idea structuring using central themes and branches. Tools (manual and digital) for mind mapping. Understanding Customer Needs and Pain Points: Customer pain points and their identification, Problem-solution fit: Linking pain points to possible solutions. Observational techniques, user inter- views, and empathy mapping. Evaluating Opportunities: Difference between an "idea" and an "opportunity." Basic filters: Desir- ability, feasibility, and viability. Tools: SWOT Analysis, Opportunity Matrix, Industry trends, market gaps.	**3**
III	**Business Model Development** Introduction to Business Model Canvas: Definition and purpose of a business model, Overview of the Business Model Canvas by Osterwalder, Benefits of using BMC for startups. Key Components of BMC: Value Proposition: Defining what unique value the product/service of- fers. Addressing customer pain points. Customer Segments: Identifying target customers. Creating customer personas Revenue Models: Direct sales, subscriptions, freemium, licensing, etc. Basic Market Research for Validation: Importance of market research in early-stage business de- velopment. Designing effective surveys and customer feedback forms. Conducting basic interviews and analyzing responses. Introduction to MVP (Minimum Viable Product) and feedback loops.	**3**
IV	**Customer Acquisition, Pitching & Funding Sources** Search Engine Optimization (SEO): Basics of how search engines work, Keyword research and content optimization, On-page vs. off-page SEO Importance of Digital Presence – Website essentials, blogs, and analytics tools. Customer Acquisition Strategies: Understanding the Customer Journey – Awareness, interest, de- cision, action. Early-Stage Customer Acquisition Tactics: Word-of-mouth & referrals, Influencer mar- keting (micro-influencers), Email marketing basics, building a landing page and collecting lead. Crafting an Elevator Pitch: Definition and purpose, Key elements: Problem, solution, value propo- sition, target audience, Delivery tips: Clarity, brevity, confidence Overview of Funding Sources: Public & private capital sources, venture capital, debt financing. Bootstrapping: Meaning, benefits, and risks, Angel investors: Role, expectations, approach, Brief on incubators, government schemes, crowdfunding.	**6**
	Total	**15**

Suggested List of Experiments/Assignments (Set of Suggested Activities)

Sl. No.	Title	Objective	Description
1		To encourage students to explore their personal views on entrepreneurship and recognize the key	**Write a reflective essay** (500–600 words) based on the following: • Explain what entrepreneurship means to you personally.

	Entrepreneurial Mindset Reflection	characteristics of an entrepreneurial mindset by studying the journey of a real-world entrepreneur.	• Identify an entrepreneur (Indian or global) whom you admire and explain the reasons for your admiration. • Highlight specific mindset traits (e.g., risk-taking, resilience, innovation, adaptability) that contributed to this entrepreneur's success. • Reflect on how these traits align with your own strengths or indicate areas you wish to develop.
2	Idea Generation Challenge	To foster creativity, structured brainstorming, and the ability to identify potential business opportunities based on real-world problems.	**Generate 10 Business Ideas** Use any structured brainstorming technique Ideas can be tech-based, social impact, service-based, or product-based 2. Select One Idea- Choose the most promising idea from your list 3. Write a 1-page Concept Summary, include the following: • Problem Identified: Describe the specific problem or pain point your idea addresses. • Solution Overview: Briefly describe your business idea. • Target Audience: Identify the group of people or organizations that would benefit. • Market Potential: Discuss the viability and scalability of the idea.
3	Business Model & Customer Validation	To help students develop a clear, structured business model and test its assumptions through customer conversations. The goal is to learn how to validate ideas through real-world feedback and refine the business concept accordingly.	**Part A: Business Model Canvas** 1. Choose a business idea (from Assignment 2 or a new one). 2. Create a Business Model Canvas with all 9 key blocks: o Customer Segments o Value Propositions o Channels o Customer Relationships o Revenue Streams o Key Resources o Key Activities o Key Partnerships o Cost Structure 3. Present the BMC in visual or tabular format.

			Part B: Customer Interviews & Insights 1. Identify 2–3 potential customers from your target segment. 2. Conduct brief interviews (5–10 minutes each) to gather insights on: o Their pain points o Their reaction to your proposed solution o Willingness to pay or use your product/service 3. Summarize findings in a 1–1.5 page report that includes: o Key customer quotes or paraphrased insights o A revised Value Proposition or Customer Segment block (if needed) 4. A short reflection: key learnings and potential changes to your idea.
4	Business Launch Plan – Marketing & Financial Snapshot	To develop a practical understanding of how marketing stratey and financial planning go hand-in-hand in launching a startup. Students will define a basic marketing campaign and align it with estimated costs, pricing, and projected revenue	You are preparing to launch your business idea. Prepare a combined Marketing and Financial Snapshot including the following **Part A: Marketing Campaign Plan** • Define your target market by identifying primary customers. • Design a mini-campaign using one or more of the following channels: Social media (e.g., Instagram, LinkedIn) Print/digital flyers Email marketing • Describe the campaign content, including the message or offer to be promoted. Optionally, create 1–2 sample marketing materials. Write a 300-word explanation outlining your marketing strategy and expected impact. **Part B: Financial Snapshot** 1. Startup Costs – Estimate your initial costs (fixed + variable) 2. Pricing Strategy – State your pricing model and justification Break-even Analysis – Basic cost vs. sales estimate

			4. 6-Month Revenue Projection – Expected sales and income Format: Use a simple table or spreadsheet (optional)
5	Elevator Pitch Video	To help students develop confidence and clarity in presenting their business idea in a short, compelling format. The exercise simulates real-world investor or networking scenarios where entrepreneurs must grab attention quickly.	**Prepare a 90-second elevator pitch for your business idea** (the same or refined idea used in earlier assignments). Your pitch should cover the following elements: The Problem – Problem Identification The Solution – Description of your product/service. Value Proposition – The unique value proposition. Target Audience – Audience for your idea. o Call to Action – E.g. request for support, funding, feedback, etc. **Deliver Your Pitch:** o Record a video and submit it with written version of your pitch. o Ensure clear speech, confident body language (for video), and persuasive tone. **Reflection (Short Write-up):** o Share what you learned about communicating your idea Describe challenges or rewards you experienced in the process.

Text Books:

1. Bygrave, W.D., Zacharakis, A., & Corbett, A.C. Entrepreneurship, 6th Edition, Wiley, 2025. ISBN: 9781394262809.
2. Drucker, Peter F. Innovation and Entrepreneurship: Practice and Principles, Reprint Edition, Harper Business, 2006. ISBN: 9780060851132.
3. Osterwalder, Alexander & Pigneur, Yves. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, 1st Edition, Wiley, 2010. ISBN: 9780470876411.

Reference Books:

1. Ries, Eric. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, 1st Edition, Crown Business, 2011. ISBN: 9780307887894.
2. Kawasaki, Guy. The Art of the Start 2.0: The Time-Tested, Battle-Hardened Guide for Anyone Starting Anything, Portfolio (Penguin Random House), 2015. ISBN: 9781591847847.

e-sources:

1. https://onlinecourses.nptel.ac.in/noc20_ge08/preview
2. https://onlinecourses.nptel.ac.in/noc21_mg70/preview
3. https://onlinecourses.nptel.ac.in/noc20_mg35
4. https://www.coursera.org/learn/entrepreneur-guide-beginners
5. https://wadhwanifoundation.org/
6. https://www.youtube.com/@wadhwani-foundation/videos

Program	S.Y. B. Tech. (Ability Enhancement Course)			Semester : IV			
Course	Modern Indian Language (Marathi)			Code:		IL25AEC-261	
Credits	Teaching Scheme (Hrs./Week)			Examination Scheme and Marks			
	Lecture	Practical	Tutorial	PR	OR	TW	Total
2	1	2	-	-	-	25	25

Pre-requisites : - Basic of Marathi Language

अभ्यासक्रमाची उद्दिष्टे :

1. प्रात भौषिक कौशल्यांची क्षमता विकसित करणे.
2. प्रसारमाध्यमांतिल संज्ञापनातिल स्वरूप आणि स्थान स्पष्ट करणे.
3. व्यक्तिमत्व विकास आणि भाषा यांतील सहसंबंध स्पष्ट करणे.
4. लोकशाहीतील जीवनव्यवहार आणि प्रसारमाध्यमे यांचे परस्पर संबंध स्पष्ट करणे
5. प्रसारमाध्यमांसाठी लेखनक्षमता विकसित करणे.

अभ्यासक्रम परिणाम (COs): अभ्यासक्रम यशस्वीपणे पूर्ण केल्यानंतर विद्यार्थी खालील परिणाम साध्य करू शकतील:

CO1: शैक्षणिक व व्यावसायिक वातावरणात प्रातभाषिक संवाद कौशल्ये प्रभावीपणे प्रदर्शित करणे.
CO2: प्रसारमाध्यमांच्या संज्ञापनातील रचना, भूमिका आणि महत्त्व स्पष्टपणे समजावून सांगणे.
CO3: व्यक्तिमत्व विकास आणि भाषाज्ञान यांतील परस्पर संबंधांचे विश्लेषण करणे.
CO4: लोकशाहीतील जीवनशैली व प्रसारमाध्यमे यांच्यातील परस्पर संबंधांचे मूल्यांकन करणे.
CO5: विविध प्रसारमाध्यमांसाठी अचूक, संरचित आणि प्रभावी लेखन तयार करणे.

Course Contents

Unit	Description	Duration [Hrs]
१.	भाषा आणि व्यक्तिमत्व विकास : सहसंबंध लोकशाहीतील जीवनव्यवहार आणि प्रसारमाध्यमे	७
२.	**प्रसारमाध्यमांसाठी लेखन** वृत्तपत्रासाठी बातमीलेखन आणि मुद्रितसंपादन नभोवाणीसाठी भाषणाची संहितालेखन दूरचित्रवाणीसाठी माहितीपटासाठी संहितालेखन	७
३.	भाषा, जीवन व्यवहार आणि नवमाध्यमे, सामाजिक माध्यमे नवमाध्यमे आणि समाजमाध्यमांचे प्रकार : ब्लॉग, फेसबुक, ट्विटर नवमाध्यमे आणि समाजमाध्यमांविषयक साक्षरता, दक्षता, वापर आणि परिणाम	७
४.	वेबसाइट आणि ब्लॉग, ट्विटरासाठी लेखन व्यावसायिक पत्रव्यवहार	७
	Total	२८

संदर्भ ग्रंथ :

१. सायबर संस्कृती, डॉ. रमेश वसखेडे
२. उपयोगित मराठी, संपादक डॉ. केतकी मोडक, संतोष शेंगई, सुजाता शेंगई
३. ओळख माहिती तंत्रज्ञानाची, टिमोथी जे. ओ'लिरी
४. संगणक, अच्युत गोडबोले, मोज प्रकाशन, मुंबई
५. इंटरनेट, डॉ. प्रभोध चौबे, मनोरमा प्रकाशन, मुंबई

६. व्यावहारिक मराठी, डॉ. ल. रा. नसराबादकर, फडके प्रकाशन, कोल्हापूर
७. आधुनिक माहिती तंत्रज्ञानाच्या विश्वात, शिक्षापूंकर दीपक, मराठे उज्ज्वल, उत्कर्ष प्रकाशन, पुणे

Course Contents	
Sl. No.	**Suggested List of Experiments**
1	Read a specific column (Sports, political, finance, editorial, education, international news etc) in the daily Marathi newspapers, summarize and present in the practical. A summary should be added as part of the journal. "दैनिक मराठी वर्तमानपत्रांमध्ये विशिष्ट कॉलम (क्रीडा, राजकीय, वित्त, संपादकीय, शिक्षण, आंतरराष्ट्रीय बातम्या इ.) वाचा, सारांश द्या आणि व सादरीकरण करा. त्या संदर्भातील सगळा सारांश जर्नल मध्ये जमा करावा."
2	Write blogs and posts on social media up to 200 words on recent development in their field of study. "सोशल मीडियावर त्यांच्या अभ्यासाच्या क्षेत्रातील अलीकडील विकासावर 200 शब्दांपर्यंत ब्लॉग लिहा, आणि पोस्ट करावा"
3	Professional letter / report writing. a. Write letter to the principal for organizing NSS camp in nearby village. Preparation of the budget, permission letters and report submission in the University "जवळच्या गावात एनएसएस शिबिर आयोजित करण्यासाठी मुख्याध्यापकांना पत्र लिहा. विद्यापीठात बजेट, परवानगी पत्रे आणि अहवाल सादर करणे." b.Write a letter for internship sponsorship to any organization. कोणत्याही संस्थेला इंटर्नशिप प्रायोजकत्वासाठी पत्र लिहा."
4	Book Review – Students are expected to read any novel, fiction or literature book of their choice and write a review on post it on social media of their choice. "पुस्तक पुनरावलोकन - विद्यार्थ्यांनी त्यांच्या आवडीचे कोणतेही कादंबरी, काल्पनिक कथा किंवा साहित्य पुस्तक वाचावे आणि त्यावर पुनरावलोकन लिहून ते त्यांच्या आवडीच्या सोशल मीडियावर पोस्ट करावे अशी अपेक्षा आहे."
5	Participation in Competitions (in college/outside the college) debate, declamation, elocution – A Report should be submitted स्पर्धेमध्ये (महाविद्यालयात/महाविद्यालयाबाहेर) सहभाग वादविवाद, भाषण, वक्तृत्व – अहवाल सादर करावा.
6	Group Activity: Road show, skit play, one-act play गट क्रियाकलाप : रोड शो, स्किट प्ले, एकांकिका
7	Participation in Purushottam karandam, Firodia karandak, Dajikaka Gadgil Karandak and Shreetej Karandak. पुष्कोतम करंडक, फिरोदिया करंडक, दाजीकाका गाडगीळ करंडक आणि श्रीतेज करंडक या स्पर्धेमध्ये सहभाग नोंदवावा.
8	Marathi film Review – Social Marathi movie available and write a review on post it on social media of their choice. मराठी चित्रपट पुनरावलोकन – सामाजिक आशयावर आधारित मराठी चित्रपट उपलब्ध आहे आणि त्या चित्रपटाची समीक्षा करून त्यावर सारांश लिहावा व तो वर्तमानपत्रे किंवा सोशल मीडियावर पोस्ट करावा पसंतीच्या सोशल मीडियावर पोस्ट करा.

संदर्भ ग्रंथ :

१. सायबर संस्कृती, डॉ. रमेश वसखेडे
२. उपयोगित मराठी, संपादक डॉ. केतकी मोडक, संतोष शेंगई, सुजाता शेंगई
३. ओळख माहिती तंत्रज्ञानाची, टिमोथी जे. ओ'लिरी
४. संगणक, अच्युत गोडबोले, मोज प्रकाशन, मुंबई

५. इंटरनेट, डॉ. प्रभोध चौबे, मनोरमा प्रकाशन, मुंबई
६. व्यावहारिक मराठी, डॉ. ल. रा. नसराबादकर, फडके प्रकाशन, कोल्हापूर
७. आधुनिक माहिती तंत्रज्ञानाच्या विश्वात, शिक्षापूंकर दीपक, मराठे उज्ज्वल, उत्कर्ष प्रकाशन, पुणे