Zeal Education Society's

ZEAL COLLEGE OF ENGINEERING & RESEARCH, PUNE – 41

(An Autonomous Institute Affiliated to Savitribai Phule Pune University)

NBA Accredited, NAAC Accredited with A+ Grade, ISO 21001:2018

DEPARTMENT OF ELCTRONICS AND TELECOMMUNICATION ENGINEERING

Curriculum Structure and Syllabus of

S.Y. B. Tech. – Electronics and Telecommunication Engineering

(With effect from - Academic Year 2025 - 26)
(2024 Pattern)

VISION OF THE INSTITUTE

To be a premier institute in technical education by imparting academic excellence, research, social and entrepreneurial attitude.

MISSION OF THE INSTITUTE

- To achieve academic excellence through innovative teaching and learning process.
- To imbibe the research culture for addressing industry and societal needs.
- To inculcate social attitude through community engagement initiatives.
- To provide conducive environment for building the entrepreneurial skills.

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

VISION:

To become one of the leading center in the field of Electronics and Telecommunication Engineering, developing competent engineers through innovative teaching, research promotion, social responsibility, and entrepreneurial skills.

MISSION:

M1: To improve continually the teaching learning process through well mechanized monitoring and feedback system.
M2: To create and establish research facilities for fulfilling research and learning needs of the students.
M3: To provide conducive environment for becoming socially responsible engineers.
M4: To strengthen industry-institute interaction to produce ready to work Engineers and entrepreneurs.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

PEO1: Graduates will excel in the area of analog and digital signal processing, embedded systems, VLSI, electronic product design etc., demonstrating leadership and managerial expertise in the electronics & telecommunication industry.
PEO2: Graduates will exhibit the professional skills, ethical and moral values, capabilities of working as an individual and in a team to fulfill the need of industries and society.
PEO3: Graduates will develop entrepreneurial skills to create innovative solutions, while continuously learning and staying updated for career growth in electronics and telecommunication engineering.

PROGRAM OUTCOMES (POs):

PO1: **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

PSO1: To apply knowledge to identify, develop and test the electronics and tele-communication systems using hardware and software tools

PSO2: To develop feasible solutions for real-time problems related to electronic circuit design, wireless sensor network, VLSI, embedded, microwave, Tele-communication, signal and image processing.

LIST OF ABBREVIATIONS

Abbreviation	Description
BSC	Basic Science Course
ESC	Engineering Science Course
PCC	Programme Core Course
PEC	Programme Elective Course
MDM	Multidisciplinary Minor
OE	Open Elective - Other than a particular program
VSEC	Vocational and Skill Enhancement Course
AEC	Ability Enhancement Course
ENTR	Entrepreneurship
EC	Economics
MC	Management Courses
IKS	Indian Knowledge System
VEC	Value Education Courses
RM	Research Methodology
CEP	Community Engagement Project
FP	Field Project
PROJ	Project
INT	Internship
OJT	On Job Training
CC	Co-curricular Courses
HSSM	Humanities Social Science and Management
ELC	Experiential Learning Course
B. Tech	Bachelor of Technology
L	Lecture
P	Practical
T	Tutorial
H	Hours
CR	Credits
CIE	Continuous Internal Evaluation
ETE	End Term Evaluation
TW	Term Work
OR	Oral
PR	Project

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Second Year B. Tech. – Electronics and Telecommunication Engineering: Semester - III

Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total						
ETPC302	PCC	Digital System Design & Applications	3	2	-	5	3	1	4	40	60	-	25	-	125
ETPC303	PCC	Network Analysis & Synthesis	3	-	-	3	3	-	3	40	60	-	-	-	100
ETPC304	PCC	Data Structures & Algorithms	2	2	-	4	2	1	3	40	60	-	25		125
ETMD301	MDM	Engineering Mathematics – III	3	-	-	3	3	-	3	40	60	-	-	-	100
ALOE301	OE	Open Elective - I[#]	2	-	-	2	2	-	2	40	60	-	-	-	100
ETMC301	HSSM-MC	Project Management System – I	-	2	-	2	-	1	1	-	-	25	-	-	25
ETVS302	VSEC	Problem Solving Technique – I	-	2	-	2	-	1	1	-	-	25	-	-	25
ETVS303	VSEC	Object Oriented Programing Lab	1	2		3	1	1	2	-	-	25	-	25	50
ETCE301	CEP	Project Based Learning	-	2	-	2	-	1	1	-	-	25	-	-	25
ETIN302	ELC - INT	Internship – II[*]	4 Week				-	2	2	-	-	25	-	-	25
Total			**14**	**12**	**-**	**26**	**14**	**08**	**22**	**200**	**300**	**125**	**50**	**25**	**700**

# - Select any one course from the given Open Elective Courses		
Course Code	**Course Type**	**Open Elective - I**
ALOE301A	OEC	Digital Literacy and Applications
ALOE301B		Environmental Studies
ALOE301C		Green Energy and Sustainability
ALOE301D		Basics of Consumer Electronics
ALOE301E		Renewable Energy Systems

BoS Chairman

ZES's Zeal College of Engineering & Research Narhe, Pune-41 PU/PN/Engg./285/2007

Director
ZES's Zeal College of Engineering & Research Narhe, Pune - 411041.

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Second Year B. Tech. – Electronics and Telecommunication Engineering: Semester - IV

Course Code	Course Type	Course Name	Teaching Scheme (hrs/Week)							Evaluation Scheme					
			L	P	T	H	CR			CIE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total						
ETPC405	PCC	Communication Systems	3	2	-	5	3	1	4	40	60	-	25		125
ETPC406	PCC	Signals and Systems	3	-	-	3	3		3	40	60	-	-		100
ETPC407	PCC	Linear Integrated Circuits	3	2	-	5	3	1	4	40	60	-	25	-	125
ETMD402	MDM	Principles of AI and ML	3	-	-	3	3	-	3	40	60	-	-	-	100
ALOE402	OE	Open Elective – II #	2	-	-	2	2	-	2	40	60	-	-	-	100
ETMC402	HSSM-MC	Quality Management System - II	-	2	-	2	-	1	1			25		-	25
ETAE402	AEC	Problem Solving Technique-II	-	2	-	2	-	1	1			25		-	25
ETVS404	VSEC	Python Programming Laboratory	-	4	-	4	-	2	2			50	25		75
ETIC403	ELC - INT	Internship - III	4 Weeks				-		2			25			25
Total			**14**	**12**	**-**	**26**	**14**	**08**	**22**	**200**	**300**	**125**	**75**	**-**	**700**

# - Select any one course from the given Open Elective Courses		
Course Code	**Course Type**	**Open Elective - II**
ALOE402A	OEC	Cyber Security and Laws
ALOE402B		Sustainability and Climate Change
ALOE402C		Energy Audit and Electrical Safety
ALOE402D		Digital Marketing
ALOE402E		Entrepreneurship and Innovations

BoS Chairman

ZES's Zeal College of Engineering & Research PU/PN/Engg./285/2007 Narhe, Pune-41

Director

ZES's Zeal College of Engineering & Research Narhe, Pune - 411041.

INDEX

SYLLABUS

SEMESTER - III

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** III	
Course: Digital Systems Design & Applications								**Code:** ETPC302	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	02	-	04	40	60	-	-	25	125

Prerequisites:

Number systems (binary, decimal), basic concepts of electricity and circuits, Boolean algebra for logic operations, and fundamental knowledge of electronic components

Course Objectives:

1. To provide foundational knowledge in combinational and sequential digital logic circuit design.
2. To enable students to analyse, design, and implement state machines and programmable logic devices.
3. To introduce modern digital design techniques using PLDs, FPGAs, and hardware description languages like Verilog.

Course Outcomes: After completion of this course, students will able to -

CO1	Design and implement combinational circuits using digital components.
CO2	Explain flip-flops, shift registers, and counters in circuits.
CO3	Analyze and design FSMs, implement sequence detectors.
CO4	Design circuits using ROM, PLA, PAL and understand applications.
CO5	Apply digital logic using ROMs, CPLDs, and FPGAs.
CO6	Apply fundamental concepts of VLSI, design modules using Verilog, and analyze FPGA architecture.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Combinational Circuit Design:** Digital Codes: Binary, BCD, Grey, Excess-3. Code Conversions: Binary to Grey, BCD to Excess-3 and its applications. Half and Full Adder, Half & Full Subtractor, Digital Comparator, Digital Comparator with multiple inputs, Realization of Boolean functions using Multiplexer/ demultiplexer, Parity generator and checker (Even & Odd).	07
2.	**Sequential Circuit Design:** Flip-Flops: SR, JK, D, T flip-flops, Preset & Clear operations, Truth Tables and Excitation Tables. Conversion of flip flops, Typical data sheet specifications of Flip flop, application of Flip flops	07

	Registers: Buffer registers, Shift registers (SISO, SIPO, PISO, PIPO) Counters: Asynchronous and Synchronous Counters, Ring counter, Johnson counter, Modulus counter (IC 7490), Pulse train generator	
3.	**State Machines:** Basic design steps- State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequence detector. Introduction to Algorithmic state machines- construction of ASM chart and realization for sequential circuit	07
4.	**Programmable Logic Devices:** Programmable Logic Devices (PLD): Introduction to PLDs: ROM, PLA, PAL , Designing Combinational Circuits using PLDs , Applications of PLDs in digital circuit design	07
5.	**Applications of Digital Circuits:** Introduction to Digital Circuits - Design of Sequence Detector, Design of Iterative circuit (Comparator), Design of sequential circuits using ROM & PLAs, CPLDs & FPGAs, Serial adder with Accumulator.	07
6.	**Introduction VLSI:** Introduction to VLSI, Introduction to Hardware description languages (Verilog), Verilog Concepts, Basic concepts-Modules & ports & Functions, useful modeling techniques, Introduction to FPGA Architecture.	07
	TOTAL	**42**

List of Experiments:

Perform a total of 8 experiments out of the 12 listed below:

- Select any 6 experiments from Group A
- Select any 2 experiments from Group B

Group A:

1. Design and implement code converters- Binary to Gray and BCD to Excess-3
2. Design and implement of Half Adder/ Full Adder using a) Basic Gates b) Universal Gates
3. Realization of Boolean function using Multiplexer 74151/74153, Demultiplexer 74154 / 74138.
4. Design and implementation of 1-bit comparator and 2-bit comparator
5. Design and implementation of parity generator
6. Verify characteristic tables of SR, JK, D & T Flip-flop
7. Design and implementation of Asynchronous/synchronous 3-bit counter using D flip-flop
8. Design and implement of Sequence generator/ detector using JK flip-flop
9. Design and implement MOD-10 counter using IC7490

Group B:

1. Implement a digital circuit using FPGA (Blinking LED using Simple Timer Circuit or 4-bit Binary Counter)
2. Building Combinatorial Circuit Using Data Flow Modeling Lab (https://download.ni.com/pub/gdc/tut/dataflow_lab.pdf)

3. Study modeling techniques for efficient circuit design in Verilog.

Text Books :

1. M. Morris Mano, Michael D. Ciletti , "Digital Logic and Computer Design" , Pearson Education / Prentice Hall
2. R.P.Jain , "Modern Digital Electronics" , McGraw Hill Education

Reference Books:

1. Donald P. Leach, Albert Paul Malvino, and Goutam Saha , "Digital Principles and Applications", Tata McGraw-Hill
2. Ramesh Gaonkar , "Microprocessor Architecture, Programming, and Applications with the 8085", , Pearson Prentice Hall
3. Muhammad Ali Mazidi, Janice Mazidi, and Rolin McKinlay , "The 8051 Microcontroller and Embedded Systems", Pearson India / Prentice Hall PTR
4. M. Morris Mano and Michael D. Ciletti , "Digital Design: With an Introduction to the Verilog HDL" , Pearson / Pearson Prentice Hall

E-Resources:

1. Unit 2 – Sequential Circuit Design - NPTEL Course: Digital Circuits – IIT Madras https://nptel.ac.in/courses/117/106/117106086/
2. Unit 3 – FSM and ASM Design, GeeksforGeeks – Finite State Machines Explained https://www.geeksforgeeks.org/finite-state-machine-types-design-working-and-applications/
3. Unit 4 – Programmable Logic Devices (PLDs), TutorialsPoint – Programmable Logic Devices (ROM, PLA, PAL), https://www.tutorialspoint.com/digital_circuits/digital_circuits_programmable_logic_devices.htm
4. Unit 6 – Introduction to VLSI & Verilog, HDLBits – Verilog Practice Problems (Beginner to Advanced), https://hdlbits.01xz.net/wiki/Main_Page

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** III	
Course: Network Analysis and Synthesis								**Code:** ETPC303	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

Prerequisites:

Electrical Circuits, Electronics circuits

Course Objectives:

1. To enable students to analyze and model electrical networks using graph theory, network theorems, and two-port parameters.
2. To provide understanding of resonance behavior, filters, and network functions for efficient signal processing and energy transfer.
3. To introduce the principles and techniques of one-port network synthesis using Foster and Cauer methods.

Course Outcomes: After completion of this course, students will able to -

CO1	Apply graph methods and matrices for circuit modeling, analysis.
CO2	Analyze two-port parameters and understand their interrelationships.
CO3	Solve circuits using Thevenin, Norton, Superposition, Millman, MPT.
CO4	Evaluate resonance conditions and determine frequency, bandwidth, Q-factor.
CO5	Identify and design filters, attenuators for desired frequency response.
CO6	Synthesize one-port passive networks using Foster and Cauer methods.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Graph Theory:** Definition of the terms: Node, path, degree of a node, Tree, Loop, cut set and Tie set. Incidence, cut set and Tie set Matrices:-Methods to represent networks using matrices and derive network equations, Application of Graph Theory to circuit Analysis using graph Theory to solve for currents and voltage in circuits.	07
2.	**Two Port Network and Network Function:** Definition of Two port Network. Dependent and independent variables. General Block Diagram and Parameters of two port Network, Z parameters, Y parameters, h parameters, g parameters, Transmission parameters, Interrelations between parameters Z, Y, H, transmission parameters. Inverse Transmission Parameters Network Functions: Diving point, Transfer: voltage and current.	07

3.	**Network Theorems**: **Superposition Theorem:** Linear Circuits, Application to voltage and current Analysis, **Thevenin's Theorem:** Equivalent circuit concepts, Source transformation, Thevenin's voltage and resistance, **Norton's Theorem:** Norton equivalent circuits Relation to Thevenin's theorem **Maximum Power Transfer Theorem** Resistive and complex load conditions Application in DC circuits **Millman's Theorem:** Parallel voltage sources with series resistances Application in simplification of networks.	07
4.	**Introduction to Resonance:** Definition and concept of resonance Conditions for resonance in AC circuits, Series Resonance**,** Series RLC circuit analysis Resonant frequency formula, Impedance at resonance Bandwidth and Quality factor (Q-factor), Voltage magnification. Parallel Resonance (Tank Circuit):- Parallel RLC circuit analysis Resonant frequency, Admittance and impedance behavior.	07
5.	**Filters and Attenuators:** Definition and Classification of Passive and Active Filters, Analog and Digital Filters, Filter Parameters:- Cut-off frequency, Pass band, Stop band, Transition band, Attenuation, Selectivity, Bandwidth, Types of Filters:- Low Pass Filter (LPF), High Pass Filter (HPF), Band Pass Filter (BPF), Band Stop Filter (Notch Filter)	07
6.	**Synthesis of One Port Networks:** Synthesis of reactive one-ports by Foster's and Cauer methods (forms I and II) - Synthesis of LC, RC and RL driving-point functions.	07
	TOTAL	**42**

Assignments:

Minimum 8 Assignments are expected from below list

1. **Unit 1: Graph Theory**
   a) Representation of Electrical Networks Using Graph Theory Terminology
   b) Solving Electrical Circuits Using Tie Set and Cut Set Matrices
2. **Unit 2: Two-Port Networks and Network Functions**
   a) Determining Z, Y, h, g, and Transmission Parameters
   b) Interrelation Between Two-Port Parameters and Network Function Calculation
3. **Unit 3: Network Theorems**
   a) Application of Thevenin's, Norton's and Superposition Theorems
   b) Circuit Simplification Using Millman's and Maximum Power Transfer Theorems
4. **Unit 4: Resonance**
   a) Series RLC Resonance: Calculations of Resonant Frequency and Q-Factor
   b) Analysis of Parallel Resonance Circuits and Tank Circuit Behavior
5. **Unit 5: Filters and Attenuators**
   a) Design and Analysis of Passive Filters (LPF, HPF, BPF)
   b) Characteristics and Applications of Attenuators and Active Filters

6. **Unit 6: Network Synthesis**
   a) LC, RC, and RL Network Synthesis Using Foster's Forms
   b) One-Port Network Synthesis Using Cauer's Methods (Forms I and II)

Text Books:

1. M.E. Van Valkenburg, "Network Analysis", Prentice Hall of India, Revised 3rd Ed., 2019
2. William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, "Engineering Circuit Analysis" , Mc Graw Hill 9th Ed., 2020
3. John. D. Ryder, "Network lines and Fields", 2nd Ed., Pearson Education, India
4. Ravish R Singh, "Network Analysis and Synthesis" , Tata McGraw Hill Education (India) Pvt.

Reference Books:

1. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 2013
2. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 2013 2nd Ed., Tata McGraw Hill Publishing Company, New Delhi, 2017
3. Charles K. Alexander and Matthew N.O. Sadiku, "Fundamentals of Electric Circuits" ,7th Ed., McGraw-Hill Education
4. Sudhakar Sham Mohan and Chakrborty, " Network Analysis", McGraw Hill Education (India)

E-Resources:

1. https://www.tutorialspoint.com/network_theory/network_theory_quick_guide.htm
2. https://nptel.ac.in/courses/108/105/108105159

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** III	
Course: Data Structures and Algorithms								**Code:** ETPC304	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	02	-	03	40	60	-	25	-	125

Prerequisites:

Fundamental knowledge of C programming is required**.**

Course Objectives:

1. To introduce fundamental concepts, types, and operations of data structures with attention to time and space complexity.
2. To develop the ability to design and implement various data structures like arrays, linked lists, stacks, queues, trees, and graphs.
3. To enhance problem-solving skills using efficient algorithms for searching, sorting, and graph traversal techniques.

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

CO1	Explain data structures, classifications, operations, and analyze algorithm complexity.
CO2	Compare sorting and searching algorithms based on time complexity.
CO3	Design and perform operations on arrays and linked lists.
CO4	Implement stack, queue using arrays, lists in applications.
CO5	Construct and manipulate binary and AVL trees with traversals.
CO6	Apply graph techniques and algorithms for graph-based problems.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to data structure:** Concept, Types of data structures, Common operations on data structures, Complexities, Time Complexity, order of Growth, Asymptotic Notation.	04
2.	**Sorting and Searching techniques:** Sorting and Searching techniques: Introduction, Sorting, Insertion Sort, Selection Sort, Bubble Sort, Merge-Sort, Linear search and Binary Search.	04
3.	**Linear Array and Linked List:** **Linear Arrays:** Introduction, Linear Arrays, Representation of Linear array in Memory, Traversing Linear Arrays, Insertion and deletion, 2D & Multi-dimensional Array, Sparse matrix. **Linked List:** Introduction to Linked Lists, Representation of Linked Lists in Memory, Traversing a Linked List, Searching a Linked List, Insertion into a Linked List, Deletion from a Linked List, Circularly Linked Lists, Doubly Linked Lists.	05

4.	**Stacks, and Queues in data structures:** **Stacks:** Introduction, Stacks, Array Representation of Stacks, Linked Representation of Stacks, Arithmetic Expression; Polish Notation, Recursion, Towers of Hanoi, **Queue:** Introduction, Linked Representation of Queues, Circular Queues, De-queue, Priority Queues	05
5.	**Trees in data structures:** **Trees:** Basic terminology. Binary Tree: Properties of a Binary Tree, ADT Binary trees and its representations. **Operations:** Insert, Delete & **Traversal:** Preorder, In order, Post order, **Binary Search Trees:** Searching and Inserting in Binary Search Trees, Deleting in a Binary Search Tree, Balanced Binary Trees, **AVL Search Trees:** Insertion in an AVL Search Tree, Deletion in an AVL Search Tree.	05
6.	**Graphs Theory in data structures:** **Graphs:** Introduction to graphs, Graph Theory Terminology, Sequential Representation of Graphs, Adjacency Matrix; Path Matrix, Linked Representation of a Graph, Operations on Graphs, Traversing a Graph, BFS and DFS, Spanning Trees, Minimum Spanning Trees Kruskal's and Prim's algorithm, Dijkstra's algorithm.	05
	TOTAL	**28**

List of Experiments:

Perform any 08 experiment out of 10:

1. Write a C program to implement a linear search and Binary Search for a given array.
2. Write a C program to arrange the list of students according to roll numbers in ascending order using 1) Bubble Sort 2) Insertion sort
3. Write a C program to implement a sparse matrix with operations like initialize empty sparse matrix, insert an element, sort a sparse matrix on row-column, transpose a matrix, etc.
4. Write a C program to develop a hash table to implement hashing. **(Content Beyond Syllabus)**
5. Write a C program to write functions to 1) Add and delete the nodes in a linked list. 2) Compute total number of nodes in the linked list 3) Display list in reverse order using recursion.
6. Write a C program to implement stack using a linked list and perform evaluation of a postfix expression using stack.
7. Write a C program to implement queue operations.
8. Write a C program to implement tower of hanoi using recursion.
9. Write a C program to implement tree traversal.
10. Write a C program to implement graph traversal.
11. **Perform at least one practical using virtual lab (VLab). (Compulsory)**

Text Books:

1. "Schaum's Outline of Data Structures", Mcgraw-Hill Companies Incorporated.
2. AVAho, J Hopcroft, JD Ullman, "Data Structures and Algorithms", Addison- Wesley,

3. E. Horowitz, S. Sahni, S. Anderson-freed, "Fundamentals of Data Structures in C", Second Edition, 2008, University Press, ISBN 978-81-7371-605-8.

Reference Books:

1. Alfred V. Aho, Jeffery D. Ullman, "Data Structures & Algorithms", Person.
2. MT Goodrich, R Tamassia, DM Mount, "Data Structures and Algorithms in Java", 5th Ed., Wiley, 2010. (Equivalent book in C also exists).

E-Resources:

NPTEL Course:

1. https://nptel.ac.in/courses/106/102/106102064/
2. http://cse01-iiith.vlabs.ac.in/
3. https://ds2-iiith.vlabs.ac.in/data-structures-2/

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** III	
Course: Engineering Mathematics – III								**Code:** ETMD301	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

Prerequisites:

First order and first-degree differential equations, calculus and vector differentiation.

Course Objectives:

1. Familiarize students with higher-order differential equations, transforms, statistics, probability, and vector calculus concepts.
2. Equip students with mathematical techniques to enhance analytical thinking and solve discipline-specific problems.

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

CO1	Solve higher-order differential equations and model electrical circuits.
CO2	Analyze data using statistical and probability concepts.
CO3	Apply Z-transform concepts in digital signal processing.
CO4	Understand Laplace transform and use it in applications.
CO5	Evaluate Fourier transforms and apply in signal processing.
CO6	Apply vector integral calculus in electromagnetic field problems.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Linear Differential Equations:** Linear Differential Equations (LDE) of nth order with constant coefficients, Method of variation of parameters, Cauchy's and Legendre's D.E., Simultaneous DE and applications of differential equations to electric circuits.	04
2.	**Statistics and Probability:** Measures of central tendency, Measures of dispersion, Moments, Skewness and Kurtosis, Correlation and Regression. Definition and theorems on Probability, Probability Distributions: Binomial distribution Poisson distribution, Normal distribution, Test of Hypothesis: Chi-Square test.	04
3.	**Z- Transforms:** Definition, Properties of Z-transform, Z- transform of Standard Sequences. Inverse Z-transform, Solution of difference equation by Z-transform.	05
4.	**Laplace Transform:** Definition and properties of Laplace transform, Inverse Laplace transform, Applications of Laplace transform to solve differential equation.	05

5.	**Fourier Transforms:** Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Transform, Inverse Fourier Transform, Fourier Sine transform, Fourier Cosine transform, Inverse Fourier Sine Transform, Inverse Fourier Cosine Transform.	05
6.	**Vector Integral Calculus & Applications:** Line integral, Work-done, Green's Lemma, Gauss's Divergence theorem, Stroke's theorem. Applications of vector integral calculus in Electro-magnetic field.	05
	TOTAL	**28**

Text Books:

1. B.S. Grewal, "Higher engineering Mathematics", Khanna publishers, Delhi (40th edition, 2008)
2. P. N. Wartikar & J. N. Wartikar, "Applied Mathematics, Volumes I and II", Pune Vidyarthi Griha Prakashan, Pune
3. H.K. Das. "Higher Engineering Mathematics", S. Chand Publication.

Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley Publications, 2015.
2. Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists", 5e, Elsevier Academic Press.
3. B.V. Raman, "Engineering Mathematics", Tata McGraw-Hill.
4. Wylie C.R., Barrett L.C., "Advanced Engineering Mathematics", McGraw-Hill, Inc.
5. Thomas L. Harman, James Dabney and Norman Richert, "Advanced Engineering Mathematics with MATLAB", 2e, Brooks/Cole, Thomson Learning.

E-Resources:

1. NPTEL Course : Transform Calculus and its Applications in differential equations https://nptel.ac.in/courses/111/105/111105123/
2. NPTEL Course "Probability Theory and Applications, https://nptel.ac.in/courses/111/104/111104079/

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)							**Semester:** III		
Course: Project Management System – I							**Code:** ETMC302		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Interactive mind-set for practical.

Course Objectives:

1. To acquire basic knowledge of Problem-solving techniques.
2. To understand the structured way of solving problems with the right tools.

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

CO1	Know the project and its importance.
CO2	Understand the structured way of project execution process.
CO3	Understand on how to project, goals and timeline.
CO4	Know the key principles of project management.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Project & Management System:** What is a project, What is Project Management, Types, Importance and its benefits	06
2.	**Project Management Process:** Planning, Execution, Monitoring & Control, Deliverables, Stakeholders.	06
3.	**Principles:**12 Principles of Project Management.	16
	TOTAL	**28**

Text Books:

1. K. Nagarajan, "Project Management", New Age International Publishers.
2. Joseph Heagney, "Fundamentals of Project Management", AMACOM.
3. Harold Kerzner, "Project Management: A Systems Approach to Planning, Scheduling, and Controlling", Wiley.

Reference Books:

1. "A Guide to the Project Management Body of Knowledge (PMBOK Guide)", Project Management Institute.
2. B. B. Goel, "Project Management: Principles and Techniques", Deep & Deep Publications Pvt. Ltd.

E-Resources:

1. Dr. Nimisha Singh, "Introduction to Project Management: Principles & Practices", NPTEL Course - https://onlinecourses.swayam2.ac.in/imb25_mg167/preview
2. Prof. Raghu Nandan Sengupta, "Project Management", NPTEL Course - https://onlinecourses.nptel.ac.in/noc25_mg78/preview

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** III	
Course: Problem Solving Techniques - I								**Code:** ETVS303	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Interactive mind-set for practical.

Course Objectives:

1. To acquire basic knowledge of Problem-solving techniques.
2. To understand the structured way of solving problems with the right tools.

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

CO1	Know the problem and types of problem**.**
CO2	Understand the structured way of solving a problem.
CO3	Understand the basic tools and its application.
CO4	Apply the learning to solve simple problem cases as a team.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Problem Understanding:** Define problem, Types of Problem, What is problem solving? Structured way of Problem solving – Step by Step.	06
2.	**Problem Solving Approach:** Structured step by step working model, Principles to think and apply.	06
3.	**Basic Tools for Problem Solving:** Knowing the tools and applying the right tools at the right step of problem solving, Problem solving case study.	16
	TOTAL	**28**

Text Books:

1. M.T. Somashekara, "Problem Solving and Programming Concepts", PHI Learning.
2. Dheeraj Sharma, "Problem Solving and Decision Making", McGraw-Hill Education.

Reference Books:

1. Willian Henderson, "Master Critical Thinking, Creative, Logic & Problem solving skills", Peak Publish LLC.
2. Sharma Narender, "Handbook 7 QC tools", Shakehand with Life.

E-Resources:

1. Coursera: "Creative Problem Solving" - https://www.coursera.org/learn/creative-problem-solving.
2. MindTools – "Problem Solving Techniques", https://www.mindtools.com/cx4ems0/problem-solving.

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** III	
Course: Object Oriented Programing Lab								**Code:** ETVS303	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
01	02	-	02	-	-	25	25	-	50

Prerequisites:

Basic knowledge of C

Course Objectives:

1. To impart foundational knowledge of Object-Oriented Programming (OOP) concepts and enable students to apply these principles using C++ for solving real-world problems.
2. To develop programming skills with a focus on modular design, code reusability, and abstraction through classes, inheritance, polymorphism, and templates.
3. To familiarize students with advanced C++ features such as exception handling and file operations, enabling the development of reliable and efficient software applications.

Course Outcomes: After completion of this course, students will able to -

CO1	Explain and apply OOP concepts using C++ control structures.
CO2	Demonstrate function and operator overloading for better functionality.
CO3	Design and implement classes with constructors and destructors.
CO4	Apply inheritance and polymorphism for reusable OOP programs.
CO5	Use templates, namespaces, exceptions for modular C++ applications.
CO6	Implement file operations in C++ with proper error handling.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to Object-Oriented Programming and Basics of C++:** Introduction to Object-Oriented Programming principles: Encapsulation, Abstraction, Inheritance, Polymorphism, Difference between Procedure-Oriented and Object-Oriented Programming, Structure of a basic C++ program, Input/Output operations, data types, operators, Control structures, arrays, functions (call by value and reference)	02
2.	**Functions and Operator Overloading:** Function overloading and default arguments, Inline functions, Operator overloading: Unary and Binary operators, Rules and guidelines for overloading.	02

3.	**Classes, Objects, and Constructors:** Class definition and object creation, Member variables and functions, , Access specifiers: public, private, protected, Constructors and Destructors: types and usage, Concepts of Containment and Composition.	03
4.	**Inheritance and Polymorphism:** Types of inheritance: Single, Multiple, Multilevel, Hierarchical, Constructor behavior in inheritance, Function overriding and virtual functions, Runtime polymorphism and use of pointers to objects.	02
5.	**Unit 5: Templates, Namespaces, and Exception Handling:** Templates Introduction, class templates, function templates, Exception handling: try, catch, throw, multiple catch blocks, Introduction to namespaces and their usage, Scope resolution operator	03
6.	**File Handling in C++: File streams:** ifstream, ofstream, fstream, Opening, reading, writing, and closing files, File modes and manipulation, Handling file errors	02
	TOTAL	**14**

List of Experiments:

Perform any 08 experiment out of 12:

1. Write a program in C++ to sort the numbers in an array using separate functions for read, display, sort and swap. The objective of this assignment is to learn the concepts of input, output, functions, call by reference in C++.
2. Write a C++ program that illustrates the concept of Function over loading.
3. 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. The objective of this assignment is to learn the concepts classes and objects.
4. Write a program in C++ to implement Stack. Design the class for stack and the operations to be performed on stack. Use Constructors and destructors. The objective of this assignment is to learn the concepts classes and objects, constructors and destructors
5. Write a program in C++ to implement string class. Write constructors, destructor, Accepts function and Display function.
6. Write a program in C++ to implement containment concept using Employee, B Date, & String Classes
7. Write a program in C++ to Read and Display the information of Employee Using Multiple Inheritance. Use Basic Info and Department Info as a base classes of Employee class
8. Write a C++ program which use try and catch for exception handling.
9. Write a C++ program which to implement class and function template
10. Write a C++ program which to demonstrate use of namespace in the program
11. Write a program in C++ to overload unary operators for complex class.
12. Write a C++ program which copies the contents of one file to another.

Text Books:
1. E Balagurusamy, "Programming with C++", Tata McGraw Hill, 3rd Edition. 2. Herbert Schildt, "The Complete Reference C++", 4th Edition.
Reference Books:
1. Robert Lafore, "Object Oriented Programming in C++", Sams Publishing, 4th Edition. 2. Matt Weisfeld, "The Object-Oriented Thought Process", Pearson Education.
E-Resources:
Virtual LAB Links: 1. Object Oriented Programming with C++: http://vlabs.iitb.ac.in/vlabs-dev/labs/oops/index.php 2. Problem Solving Lab: http://ps-iiith.vlabs.ac.in/ Note: Additional (min.2) pract

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** III	
Course: Project Based Learning								**Code:** ETCE301	
Teaching Scheme (Hrs./week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	**02**	**-**	**02**	**-**	**-**	**25**	**-**	**-**	**25**

Prerequisites:

Basic idea of report writing, fundamental knowledge of electronics and software languages is required.

Preamble: Most of the engineering education is based on traditional classroom instructions, where students have fair chance to get through a activity based learning processes and the academic sessions are the main focus. However, considering that how quickly engineering and technology are developing, it is essential to use a teaching-learning strategy that will help students not only acquire the fundamental skills needed by the industry, but also enable them to get adapt for the suitable changes happening in their professional careers. PBL is a method of developing electronic systems courses that will pique students' interest in electronics. This approach recommends developing multidisciplinary projects using the PBL concept to make the curriculum more engaging because electronics forms the basis for other disciplines (including computer science, signal processing, and communications). Electronics can be promoted as a basis for other disciplines by developing a new curriculum that includes practical courses (labs) where students construct whole systems incorporating inter-disciplinary knowledge.

Course Objectives:

Promote multidisciplinary, long-term, project-based learning through real-world problem solving.
Develop applications using electronics principles and previously learned telecommunication concepts.
Gain hands-on experience in design, implementation, and testing of systems collaboratively

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

CO1	Recognize real-world issues and design project aims, objectives.
CO2	Use ethical practices and safety standards for societal benefits.
CO3	Develop innovative solutions using electronics and telecommunication knowledge.
CO4	Implement technologies and present learning verbally and in writing.
CO5	Develop independent working skills and effective teamwork capabilities.
CO6	Differentiate roles and organize contributions for better team performance.

Group Structure:

Working in supervisor/mentor –monitored groups. The students plan, manage and complete a task/project/activity which addresses the stated problem.

1. **Create groups of maximum 5 (five) students in each batch**.

Project Selection:

Analyse the problem, design, and determine the values of the components. Survey through journals, patents, or field visits (a problem can be theoretical, practical, social, technical, symbolic, cultural, and/or scientific). There are no widely accepted standards for what makes a project acceptable. Projects differ substantially in terms of the activity's substance and structure, the clarity of the learning objectives, and the depth of the questions examined. It is advised to use the problem-based, project-oriented learning

methodology. The concept starts with the identification of an issue, which frequently develops from a query or "wondering." The learning process then begins with this problem formulation.

A dilemma arises from students' curiosity in various academic fields and professional settings and might be theoretical, practical, social, technical, symbolic, cultural, and/or scientific. The project topic may be interdisciplinary in view, as indicated in the preamble, since electronics serves as a crucial foundation for other fields (computer science, signal processing, and communications). Although, the selected challenge needs to use the principles of electronics and telecommunication engineering. Electronic components must make up at least 40% of the project's overall established system setup. However, in an actual instance, a project topic that is entirely software-based might be permitted.

Effective Documentation:

Effective writing skills must be taught to students in order for our engineering graduates to be able to provide documentation that works. The literature review, problem statement, aim and objectives, system block diagram, system implementation details, discussion and analysis of the results, conclusion, system limitations, and future scope are all intended to be included in the PBL final report. The creation of the PBL synopsis and final report is anticipated to involve the usage of numerous publicly accessible software tools, such as Medley (Elsevier) and Grammerly. It is anticipated that PBL mentors and guides will instruct students on how to use reliable sources of knowledge on their PBL topic, including books, magazines, and reference papers.

Evaluation & Continuous Assessment:

The organization, leader, or mentor is dedicated to analysing and evaluating program efficacy as well as student success. PBL progress is routinely tracked every week. The work needs to be reviewed once a week. Individual and team performance must be measured throughout the monitoring, ongoing assessment, and evaluation process. Authorities and supervisors/mentors oversee PBL and do ongoing evaluations. Students are required to uphold an institutional culture that values genuine teamwork, self-motivation, think, learn and share peer learning processes, and individual accountability. Through guidance and orientation programs, as well as the provision of suitable resources and services, the department or institution should assist students in this respect. Students and their supervisors/mentors must actively engage in the assessment and evaluation procedures. It is advised that all activities be routinely and legally documented. It is necessary for students to regularly evaluate their PBL work in the department's PBL log book.

The following is anticipated to be included in the PBL log book:

1. The PBL guide oversees weekly monitoring.
2. The PBL Evaluation Committee (PBL) and the PBL guide review the assessment sheet for PBL work.

The head of the department, half of the senior faculty and one industry expert (optional) make up the PEC structure. The department is responsible for maintaining the Continuous Assessment Sheet (CAS).

Recommended parameters for assessment, evaluation and weightage:

1. Idea Inception (kind of survey). (10%)
2. Outcome (Participation/ publication, copyright, patent, product in market). (50%)
3. Documentation (Gathering requirements, design & modeling, implementation/execution, use of technology and final report, other documents). (15%)
4. Attended reviews, poster presentation and model exhibition. (10%)
5. Demonstration (Poster Presentation, Model Exhibition etc.) (10%).
6. Awareness /Consideration of - Environment/ Social /Ethics/ Safety measures/Legal aspects. (5%)

Reference Books / Research Articles:

1. John Larmer, John R. Mergendoller, and Suzie Boss, "Setting the Standard for Project Based Learning", ASCD.
2. John Larmer and Suzie Boss, "Project Based Teaching: How to Create Rigorous and Engaging Learning Experiences", ASCD.
3. Erin M. Murphy and Ross Cooper, "Hacking Project Based Learning: 10 Easy Steps to PBL and Inquiry", Times 10 Publications.
4. M. Krašna, "Project based learning (PBL) in the teachers' education", 39th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO), Opatija, 2016.
5. J. Macias-Guarasa, J.M. Montero, R. San-Segundo, A. Araujo, and O. Nieto-Taladriz, "A project based learning approach to design electronic systems curricula", IEEE Transactions on Education, vol. 49, no. 3.

E- Resources:

1. Project-Based Learning, Edutopia, March 14, 2016.
2. What is PBL? Buck Institute for Education.
3. www.howstuffworks.com.
4. Condliffe, Barbara. "Project-Based Learning: A Literature Review. Working Paper." MDRC (2017).

NPTEL Resources:

c) Problem Based Learning by Dr. Indrajit Saha, National Institute of Technical Teachers Training and Research, Kolkata.

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** III	
Course: Internship – II								**Code:** ETIN302	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	-	-	02	-	-	25	-	-	25

Preamble:

Internships serve as vital educational and career development experiences, offering practical exposure in a specific field. Employers seek individuals who possess the necessary skills and an understanding of industry environments, practices, and cultures. This internship is designed as a structured, short-term, supervised training program, often centered on specific tasks or projects with clear timelines. The primary goal is to immerse technical students in an industrial setting, providing experiences that cannot be replicated in the classroom. This exposure aims to develop competent professionals who understand the social, economic, and administrative factors influencing the operations of industrial organizations.

Course Objectives:

1. Exposure to students to the industrial environment, which cannot be provided in the classroom and hence creating deployable professionals for the industry.
2. Learn to implement the technical knowledge in real industrial situations.

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

CO1	Gain exposure to industry practices and understand how academic concepts are applied in professional settings.
CO2	Develop and demonstrate effective communication and teamwork skills within a work environment.
CO3	Improve your problem-solving and time management skills by working in real-world industry settings.

Internship Requirements

1. **Internship Duration:** It is mandatory for all students to undergo an internship after every semester during vacations for the duration of 4 weeks. Internships completed during this period will be considered for the assessment of Term Work (TW).
2. **Internship Opportunities:** Students can explore various opportunities for internships at:
    a. Industries
    b. Research labs or organizations
    c. Collegiate clubs
    d. In-house research projects
    e. Online internships
3. **Support and Assistance:** Students can seek assistance for securing internships from:
    a. The Training and Placement cell, along with departmental coordinators
    b. Department or institute faculty members
    c. Personal contacts
    d. Directly connecting with industries or organizations

4. **Request Letter:** Once an industry, research organization, or collegiate club is identified, students must obtain a request letter from the concerned department or placement office. This letter, in the standard format must be duly signed by the authority, should be addressed to the HR manager or relevant authority.
5. **Confirmation Letter:** Students must submit the confirmation letter from the industry, research organization, or collegiate club to the Internship Coordinator and the Head of Department (HOD) office.
6. **Joining Report:** Upon commencing the internship, students must submit the joining report, joining letter, or a copy of the confirmation email to the Internship Coordinator and the HOD office.
7. **Faculty Mentor:** A faculty member will be assigned as a mentor to a group of students. The mentor will be responsible for monitoring, evaluating, and assessing student internship activities. The faculty mentor is also required to visit the internship location and submit formal feedback to the Internship Coordinator.
8. **Faculty Visits:** Faculty members are advised to visit the internship site once or twice during the internship period to monitor progress.
9. **Progress Report:** Students must submit progress report fortnightly to their faculty guide and the final internship report to the Internship Coordinator and department office.
10. **Evaluation Report:** After the completion of the internship, the mentor, along with the assessment panel members, should submit the evaluation report of the students to the department office and the Internship Coordinator.
11. **Internship Certificate:** Students must receive the Internship Certificate from the industry and submit it to the Internship Coordinator and department office.
12. **Presentation and Assessment:** Students are required to give a presentation on their internship work as part of the term work. The internship diary and report will also be verified and assessed.

SYLLABUS

SEMESTER - IV

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** IV	
Course: Communication Systems								**Code:** ETPC405	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	02	-	04	40	60	-	-	25	125

Prerequisites:

Electronic devices & circuits, signals & system.

Course Objectives:

1. To provide foundational knowledge of analog and digital communication principles and systems.
2. To explore modulation techniques, noise analysis, and system design elements in both analog and digital domains.
3. To develop an understanding of baseband transmission, signal representation, and pulse modulation for efficient communication.

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

CO1	Explain communication elements, spectrum, noise types, and perform calculations.
CO2	Analyze AM principles, design modulators/demodulators, explain transmitter architectures.
CO3	Explain FM/PM theory, analyze bandwidth, design modulators/demodulators.
CO4	Apply sampling theory, distinguish types, explain PAM, PWM, PPM, TDM, FDM.
CO5	Explain quantization, PCM, delta modulation, evaluate digital schemes.
CO6	Analyze baseband signaling, interpret eye diagrams, understand ISI reduction techniques.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to Communication Systems:** Introduction to Analog Communication System, The Electromagnetic & Optical Spectrum and its usage, Radio spectrum and frequency allocation, Elements of communication systems, need for modulation, Types of noise, External noise, Internal Noise, Noise calculations, signal to noise ratio, noise figure, and noise temperature.	07
2.	**Amplitude Modulation and Demodulation:** Amplitude Modulation principles, AM envelope, Modulation Index, frequency spectrum & BW, phase representation of AM wave, AM modulating circuits: Low level AM modulation, medium power, AM modulation, method Vestigial sideband(VSB). AM transmitters: Block of low level DSBFC, High Level DSBFC, SSB suppression techniques. TRF and Super heterodyne receiver.	07
3.	**Angle Modulation:** Basic concept, mathematical analysis, frequency spectrum of FM wave, sensitivity, phase deviation and modulation index, frequency deviation and percent modulated waves, bandwidth requirement, deviation ratio, Narrow Band FM, and Wide Band	07

	FM. Varactor diode modulator, FET reactance modulator, stabilized reactance modulator- AFC, Direct FM transmitter, indirect FM Transmitter, pre-emphasis and de-emphasis. Amplitude limiting, FM demodulators	
4.	**Pulse Analog Modulation:** Need of analog to digital conversion, sampling theorem for low pass signal in time domain, and Nyquist criteria, Types of sampling- natural and flat top. Sampling techniques, aliasing error, and aperture effect. PAM, PWM, PPM generation and detection. TDM and FDM	07
5.	**Digital Representation of Analog Signals:** Quantization of Signals: Quantization error, Uniform & Non-Uniform types of Quantization, Mid-rise &Mid-tread Quantizer. Companding: A-law & μ-law. **Pulse Code Modulation system**: Generation & Reconstruction, Differential Pulse code modulation, Delta Modulation, Adaptive Delta Modulation.	07
6.	**Baseband transmission & reception:** Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester Baseband Pulse Shaping, M-ray Signaling, ISI, eye diagram, scrambler, Unscramble	07
	TOTAL	**42**

List of Experiments:

Perform any 10 experiment out of 15:

1. Experiment on practical implementation of Amplitude Modulation
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. Experiment on practical implementation of Amplitude Demodulation
4. Experiment on practical implementation of Sampling and reconstruction and also observe aliasing effect by varying sampling frequency.
5. Experiment on practical implementation of PAM system.
6. Experiment on practical implementation of PWM system.
7. Experiment on practical implementation of Pre-emphasis and De-emphasis
8. Study of PCM
9. Study of Companded PCM
10. Study of DM: Generation and detection
11. Study of ADM: Generation and detection
12. Study of line codes (NRZ, RZ, POLAR RZ, BIPOLAR (AMI), MANCHESTER) & their spectral analysis.
13. Verify Sampling Theorem using simulation
14. Simulation program to calculate Signal to noise ratio for PCM system & DM system.
15. Simulation of AM modulation and demodulation using MATLAB

Note: Visit to AIR station/telephone exchange is compulsory. Students are supposed to attach report of visit to journal

Text Books:

1. George Kennedy, "Electronic Communications‖", McGraw Hill.
2. Wayne Tomasi, "Electronics Communication System '-Fundamentals through Advanced", 5th Edition-Pearson Education.
3. B. P. Lathi, "Modern Digital and analog Communication System", Oxford University press, 4th Edition.

Reference Books:

1. Simon Haykin, "Communication Systems", John Wiley & Sons, 4th Edition.
2. Taub & Schilling, "Principles of Communication Systems", Tata McGraw-Hill.
3. R P Singh, S D Sapre, "Communication System-Analog & Digital", 2nd Edition –Tata McGraw Hill Publication.
4. Bernard Sklar and Prabitra Kumar Ray, "Digital Communications Fundamentals and Applications", Pearson Education 2nd Edition.

E-Resources:

NPTEL Course:

1. NPTEL Course "Principles of Communication Systems-I", https://nptel.ac.in/courses/108/104/108104091/

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** IV	
Course: Signals and Systems								**Code:** ETPC406	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

Prerequisites:

Engineering Mathematics I, II and III.

Course Objectives:

1. To introduce the fundamental concepts of signals and systems, their classifications, and representations in continuous and discrete time.
2. To develop analytical skills for performing operations on signals and systems including convolution, Fourier, and Laplace transforms.
3. To provide a foundation in probability and random variables for analyzing system behavior under uncertainty.

Course Outcomes: After completion of this course, students will able to -

CO1	Identify and represent signals, classify elementary signal types.
CO2	Perform operations, categorize systems by linearity, causality, stability.
CO3	Compute convolution, determine responses, examine system interconnections.
CO4	Apply Fourier transform, evaluate signals, interpret amplitude and phase spectra.
CO5	Utilize Laplace transforms to solve, model, and analyze systems.
CO6	Apply probability principles to analyze stochastic signal behavior.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to Signals:** **Signals:** Introduction, Graphical and Functional representation of Continuous and Discrete time signals. Basics of Elementary signals: Unit step, Unit ramp, parabolic, Impulse, Sinusoidal, Real exponential, Complex exponential, Rectangular pulse, Triangular, Signum, Sinc function**.** **Operation on signals:** Time shifting, time reversal, time scaling, amplitude scaling, signal addition, subtraction, signal multiplication in C.T. and D.T. mode.	07
2.	**Systems:** Introduction, Classification of Systems: 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.	07

3.	**Operation on Systems:** input-output relation, convolution sum, convolution integral, computation of convolution integral using graphical, theoretical and tabulation method. Computation of convolution sum. Properties of convolution. System interconnection.	07
4.	**Applications of Fourier Transform:** Fourier Transform (FT) representation of aperiodic and periodic CT signals, Dirichlet condition for existence of Fourier transform, amplitude and phase characteristics of a signal from its Fourier Transform, Properties and their significance, applications of Fourier Transform in signal Processing, Image Processing, Communication and Biomedical Engineering.	07
5.	**Applications of Laplace Transform:** Definition of Laplace Transform (LT), need of Laplace transform, ROC, Properties of ROC, Representation of system using algebraic expressions in the s-domain, Laplace transform of standard periodic and aperiodic functions, properties and their significance, analyzing input responses like step, impulse, or sinusoidal signals.Use of Laplace Transform in Ordinary and partial differential equations and initial and final Boundry value.	07
6.	**Probability and Random Variables:** **Probability**: Experiment, sample space, event, probability, conditional probability and statistical independence, Bayes theorem, **Random variables:** Continuous and Discrete random variables, cumulative distributive function, Probability density function, properties of CDF and PDF. Statistical averages, mean, moments and expectations, standard deviation and variance.	07
	TOTAL	**42**

Text Books:

1. Simon Haykins and Barry Van Veen, "Signals and Systems", Wiley India, 2nd Edition
2. M.J. Roberts, "Signal and Systems", Tata McGraw Hill.
3. P. Ramesh Babu, R Anandanatarajan, "Signals and Systems", Scitech Publications (India) Pvt. Ltd

Reference Books:

1. Charles Phillips, "Signals, Systems and Transforms", Pearson Education, 3rd Edition.
2. Peyton Peebles, "Probability, Random Variable, Random Processes", Tata Mc Graw Hill, 4th Edition.
3. A. Nagoor Kanni "Signals and Systems", Mc Graw Hill, 2nd Edition.

E-Resources:

1. NPTEL Course "Principles of Signals & System", nptel.ac.in/courses/108/104/108104100/

2. Lecture Series on, "Signals & Systems", Video Lectures | Signals and Systems | Electrical Engineering and Computer Science | MIT OpenCourseWare
3. Lecture Series on, "Signals & Systems", http://ww25.nptelvideos.in/2012/12/signals-and-system.html?subid1=20250803-1340-0768-bb4b-3744c46dda3e

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** IV
Course: Linear Integrated Circuits									**Code:** ETPC407
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	02	-	03	40	60	-	-	25	125

Prerequisites:

Basic Electronics Engineering, Electronic Devices & Circuits

Course Objectives:

1. To provide students with a strong foundation in the principles, characteristics, and types of linear integrated circuits, including operational amplifiers and voltage regulators.
2. To equip students with the skills to analyze and design various op-amp-based circuits, including amplifiers, filters, and oscillators.
3. To enable students to design active filters, voltage regulators, and power amplifiers using linear ICs for specific signal processing tasks.

Course Outcomes: After completion of this course, students will able to -

CO1	Explain op-amp characteristics like offset, slew rate, CMRR.
CO2	Design and analyze basic linear op-amp applications.
CO3	Implement and evaluate comparators and non-linear op-amp circuits.
CO4	Design filters and oscillators using operational amplifiers.
CO5	Analyze and design voltage regulators using ICs.
CO6	Compare and implement DACs, ADCs**,** interpret performance specifications.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**OP AMP Fundamentals:** Practical OP amp, Input offset voltage, Input Bias current, Input offset current, Total output offset current, thermal drift, Effects of variation in Power supply voltage, Noise, Common Mode Rejection Ratio, slew rate.	07
2.	**Applications of OP AMP I:** Inverting Amplifier, Non-inverting Amplifier, Summing Amplifiers, Instrumentation Amplifier, Voltage to Current Converter with grounded load, Integrator, Differentiator. Logarithmic amplifier, Antilogarithmic amplifier	07
3.	**Applications of OP AMP II:** **Comparators:** Basic Comparators, IC comparator LM 311, LM 339, Zero crossing detector, Schmitt Trigger, Limitations of OP-Amp as Comparators, **Converters:** Voltage to Frequency converter, Frequency to Voltage Converter.	07

	Clippers and Clampers, Peak Detector, Sample and Hold Circuit	
4.	**Active Filters and Oscillators:** **Active Filters:** Active Filters Types, first order & second order Low-pass, high-pass and band-pass Butterworth filters. **Oscillators:** RC Phase Shift Oscillator, Wein Bridge Oscillator, Square Wave Generator, Triangular Wave Generator, Saw tooth Wave Generator VCO 566.	07
5.	**IC Voltage Regulators:** Fixed Voltage Series Regulators 78XX, 79XX,(numerical), Design regulator using 723 regulator, Adjustable Voltage Regulator IC LM317, LM 337, (numerical).	07
6.	**Analog to Digital and Digital to Analog Converters:** D/A converter, specifications, weighted resistor type, R-2R Ladder type, (numerical on DAC), monolithic IC DAC 0808. A/D Converters, specifications, Flash type, Successive Approximation type, (numerical on DAC), monolithic IC ADC 0809.	07
	TOTAL	**42**

List of Experiments:

Perform any 08 experiment out of 12:

1. To measure OPAMP parameters & compare with standard typical values of parameters.
2. To design, construct and test inverting, non-inverting and differential amplifier using IC 741.
3. To build & test Summing Amplifier, Subtractor using IC 741.
4. To build & test Integrator & Differentiator using IC 741.
5. To study Instrumentation Amplifier.
6. To design, construct and plot the frequency response of second order low pass and high pass filter having the fc of 1 kHz.
7. To design a Schmitt trigger circuit for generating a square wave output.
8. To build & test RC Phase Shift Oscillator using IC 741.
9. To build & test Wein Bridge Oscillator using IC 741.
10. To build & test Square Wave Generator, Triangular Wave Generator using IC 741.
11. Design & test a Voltage Regulator using IC 78XX.
    Design & test a adjustable voltage regulator using ICLM 317.

Text Books:

1. Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", 4th Edition, Pearson Education.
2. D. Roy Choudhary, Shail Jain, "Linear Integrated Circuits" , New Age International.

Reference Books:

1. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", Tata McGraw Hill., Third Edition.
2. B. Somanathan Nair, "Linear Integrated Circuits- Analysis, Design & Applications", Wiley India

3. David Bell, "Operational Amplifiers and Linear ICs", Third Ed, Oxford University Press.
4. S. Salivahanan & V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", TMH, 2nd Edition, 4th Reprint, 2016.

E-Resources:

1. NPTEL Course:
   a) NPTEL course on Integrated Circuits & Applications - https://onlinecourses.nptel.ac.in/noc24_ee73
   b) NPTEL course on Analog Circuits – https://nptel.ac.in/courses/117107094
2. Virtual Lab on Analog Electronics Circuits, https://aec-iitkgp.vlabs.ac.in/
3. Virtual Lab on Analog Circuits, https://ae-iitr.vlabs.ac.in/

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** IV
Course: Course: Principles of AI and ML									**Code:** ETMD402
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

Prerequisites:

1. Basic knowledge of linear algebra, probability, and statistics.
2. Familiarity with Python and basic programming concepts.
3. Understanding of signals, systems and digital logic.

Course Objectives:

1. To introduce the foundational concepts, history, and classifications of Artificial Intelligence and its relationship with ML and DL.
2. To equip students with problem-solving techniques including search algorithms, expert systems, and intelligent agents.
3. To explore machine learning models and techniques for supervised and unsupervised learning with real-world applications

Course Outcomes: After completion of this course, students will able to -

CO1	Explain AI foundations, types, applications; differentiate AI, ML, DL.
CO2	Analyze intelligent agents, evaluate rationality, ethics, global standards.
CO3	Implement search strategies and apply constraint satisfaction techniques.
CO4	Describe expert systems, apply inference, design chatbot using Tiny ML.
CO5	Define ML concepts, evaluate hypotheses, apply supervised learning algorithms.
CO6	Implement clustering algorithms, apply PCA and unsupervised techniques.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to Artificial Intelligence:** Basics of AI: Foundation and History of AI, Overview of AI problems, Evolution of AI, Applications of AI, Classification of AI. AI vs ML vs DL (Deep Learning). **Intelligent Agent:** Types of AI Agent, Concept of Rationality, nature of environment, structure of agents. Turing Test in AI. Ethics in AI: benefits and risks of AI, Introduction to Global Compliances for Ethical AI, Human vs Robots.	07

2.	**Problem Solving Fundamentals:** Search Algorithms in Artificial Intelligence: Terminologies, Properties of search Algorithms, Types of search algorithms: uninformed search and informed search, State Space search Problem Reduction. Constraint Satisfaction problem: Interference in CSPs; Back tracking search for CSPs; Local Search for CSPs; structure of CSP Problem.	07
3.	**Expert System in AI:** Introduction to Expert Systems, Components of Expert Systems. Rule based expert system- Introduction, K rules as knowledge representation, schemes, Expert system development teams, Structure, Characteristics, Forward chaining and backward chaining inference techniques, Conflict resolution basic introduction, Advantages and disadvantages, Applications of Expert Systems ChatBots (NLP based expert systems)- Only Simple logic bots, Basics of Tiny ML.	07
4.	**Introduction of Machine Learning:** What is Machine Learning, Types of Learning, Supervised, Unsupervised, Reinforcement Well posed learning problem, designing a learning system, issues in machine learning. Hypothesis Space, Hypothesis functions, Hypothesis Evaluation, Bias, Variance, Under fitting, Overfitting, Inductive bias, Evaluation, Training, Testing, Cross validation: Error Analysis, Error metrics, Precision and recall	07
5.	**Supervised Learning:** Preprocessing of data: Normalization and Scaling, Standardization, Various feature selection techniques (Wrapper, Filter and Embedded method), Sequential forward and backward selection. Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks, Neural network for supervised learning, Case study on KNN and logistic regression.	07
6.	**Unsupervised Learning:** Clustering Fundamentals- Basics, K-means: Findings optimal number of clusters, DBSCAN, Spectral Clustering, Hierarchical Clustering, Case study on clustering, Dimensionality Reduction using Principal Component Analysis (PCA), Neural network for unsupervised learning	07
	TOTAL	**42**

Text Books:

1. Russell, S. and Norvig, "Artificial Intelligence - A Modern Approach", 3rd edition, Prentice Hall.
2. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", Cambridge University Press, Edition 2012.
3. T. Mitchell, "Machine Learning", McGraw-Hill, 1997.

Reference Books:

1. Dan W Patterson, "Introduction to Artificial Intelligence & Expert Systems", PHI. 2010
2. S Kaushik, "Artificial Intelligence", Cengage Learning, 1st ed. 2011.
3. Ric, E., Knight, K and Shankar, "Artificial Intelligence", 3rd edition, Tata McGraw Hill
4. Luger, G.F. "Artificial Intelligence -Structures and Strategies for Complex Problem Solving", 6th edition, Pearson.
5. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 2004.
6. Ethem Alpaydin, "Introduction to Machine Learning, PHI 2nd Edition-2013.
7. Nilsson Nils J, "Artificial Intelligence: A new Synthesis", Morgan Kaufmann, Inc. San Francisco, CA.

E-Resources:

1. https://ww25.nptelvideos.in/?subid1=20250629-0219-53a5-a147-53c8db0a9cc9
2. https://www.coursera.org/

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** IV	
Course: Quality Management System – II								**Code:** ETMC403	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Interactive mind-set for practical and quality thinking.

Course Objectives:

To understand the QMS clauses and its PDCA way of working in an organization.

Course Outcomes: After completion of this course, students will able to -

CO1	Understand the organization and its functional alignment for QMS.
CO2	Understand the quality management system and processes.
CO3	Know the leadership drive and involvement in building quality culture.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	Scope, Normative References, Terms & Definition	04
2.	**Context of the Organization:** Understanding the organization and its context, Needs and expectations of interested parties, Determine the scope of the quality management system, Quality management system and its processes.	10
3.	**Leadership:** Accountability, Responsibilities and Commitment for QMS culture, Quality policy.	14
	TOTAL	**28**

Text Books:

1. Kanishka Bedi, "Quality Management", Oxford University Press.
2. Subburaj Ramasamy, "Total Quality Management", McGraw Hill Education.
3. Dale H. Besterfield, "Total Quality Management", Pearson Education.

Reference Books:

1. QMS ISO 9001:2015 Standards

E-Resources:

1. Dr. N.Venkateshwarlu, "Quality Engineering & Management", NPTEL Course, https://onlinecourses.swayam2.ac.in/nou25_me09/preview

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** IV
Course: Problem Solving Techniques – II									**Code:** ETAE401
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Interactive mind-set for practical.

Course Objectives:

1. To acquire basic knowledge of Problem-solving planning.
2. To understand the effectiveness check and sustenance.

Course Outcomes: After completion of this course, students will able to -

CO1	Know how to plan and execute the problem solving.
CO2	Understand the measure and monitoring of problem-solving plan and execution.
CO3	Understand the effectiveness measures of problem solving.
CO4	Understand the sustenance working plan and execution.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Planning & Execution:** What is planning? PDCA way of thinking and planning, Inputs requirement mapping.	08
2.	**Measure of Planning & Execution:** Key measures, How to measure and monitor? Reviews & Reporting with documentation.	08
3.	**Effectiveness measures & Sustenance:** Define effectiveness measures, How to measure and monitor? Importance of Sustenance, How to plan and execute sustenance activities.	12
	TOTAL	**28**

Text Books:

1. B. Mahadevan, "Operations Management: Theory and Practice", Pearson Education India.
2. L.M. Prasad, "Principles and Practices of Management", Sultan Chand & Sons.

Reference Books:

1. The PDCA Cycle for Industrial Improvement: Applied Case Studies (Synthesis Lectures on Engineering, Science, and Technology), Springer.

E-Resources:

1. Coursera, "Initiating and Planning Projects" - https://www.coursera.org/learn/project-planning

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** IV
Course: Python Programming Lab									**Code:** ETVS404
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	04	-	02	-	-	50	25	-	75

Prerequisites:

1. Basic knowledge of computer operations and logical reasoning.
2. Familiarity with programming fundamentals like variables, loops, and conditionals.
3. Understanding of basic mathematics and algorithmic thinking.

Course Objectives:

1. To be able to introduce core programming basics and various Operators of Python programming language.
2. To demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.
3. To understand about Functions, Modules and Regular Expressions in Python Programming

Course Outcomes: After completion of this course, students will able to -

CO1	Explain the basic concepts of Python programming.
CO2	Demonstrate mathematical and string manipulation functions in Python.
CO3	Apply core python scripting elements such as flow control structures and loops
CO4	Develop essential skills in python programming concepts like data structures and different built in functions.
CO5	Apply a modular programming approach by making use of functions
CO6	Demonstrate the ability to data frames, plots and files in different modes.

List of Experiments:

Perform any four from each group:

Group A -Basic Arithmetic Operations

1. Write a Python program to display "Welcome to Python Programming for E&TC" and perform basic arithmetic operations (addition, subtraction, multiplication, and division) on two user-input numbers.
2. Program to Swap two variables.
3. Program to find maximum of two or three numbers.
4. Program to check if a number is even or odd, number is positive, negative or 0.
5. Write a Python program to generate the Fibonacci series up to n terms and check whether a given number is prime or not.
6. Write a Python function to calculate the factorial of a number using recursion. Also, define a user function to calculate the square of a number.

Group B-Basic OOPs Operations & Data Types

1. Write a Python program to input three voltages and determine which one is maximum using conditional statements.
2. Perform oops operations using python class object, operator overloading, inherence, polymorphism, encapsulation.
3. Write a Python program to input a list of sensor readings and perform operations such as sorting, searching, slicing, and finding maximum/minimum values.
4. Write a Python program to input a string and display the frequency of each character using a dictionary.
5. Write a Python program to create two sets of signal IDs and perform union, intersection and difference operations.
6. Write a Python program for sensor interface simulator using class with dictionary

OR

Write a Python program for communication system simulator using class, polymorphism, inheritance.

Group C-Basic Python Libraries

7. Write Python programs using lambda, map(), filter(), and reduce() to process a list of signal amplitudes (e.g., filter values above threshold).
8. Write a Python program to define a class Electronic Device with attributes like name, power and voltage. Create objects and display their data.
9. Write a Python program to check if a list is Empty or Not.
10. Write a Python program to create and view elements of a list.
11. Write a Python program to access List Index and Values.
12. Write a Python program to add two Lists.

Group D-Programming using Python Libraries

13. Write a Python program to read data from a file (text or CSV) and count the number of lines, words and characters. Also, write back processed data to a file
14. Write a Python program to handle exceptions like divide by zero, file not found and invalid input using try-except blocks.
15. Write a Python program to perform basic array operations, matrix addition, subtraction and multiplication using NumPy.
16. Write a Python program to generate and plot sine, cosine and square wave signals using matplotlib.
17. Write a Python program using Pandas to load sensor data from a CSV file, display basic statistics, filter records based on conditions and visualize data.
18. Write a Python Program to keep record of students data ,manipulate files to store, update and delete students information.

Text Books:

1. Michael T. Goodrich, Roberto Tammassia, Michael H. Goldwasser, "Data structures and algorithm in Python," Willey Publications, ISBN:978-1-118-29027-9

Reference Books:

1. Allen Downey, Jeffery Elkner, Chris Meyers. "How to think like a Computer Scientist: Learning with Python", Dreamtech Press.
2. Yashwant Kanetkar & A. Kanetkar, "Let us Python, BPB Publisher.
3. Eric Matthes, "Python Crash Course".
4. Luciano Ramalho, "Fluent Python".
5. Mark Lutz, "Learning Python".

E-Resources:

1. www.nptelvideos.in
2. https://snakify.org/en/
3. https://docs.python.org/3/
4. https://www.w3schools.com/python/

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** IV	
Course: Internship – III								**Code:** ETIN403	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	-	-	02	-	-	25	-	-	25

Preamble:

Internships serve as vital educational and career development experiences, offering practical exposure in a specific field. Employers seek individuals who possess the necessary skills and an understanding of industry environments, practices, and cultures. This internship is designed as a structured, short-term, supervised training program, often centered on specific tasks or projects with clear timelines. The primary goal is to immerse technical students in an industrial setting, providing experiences that cannot be replicated in the classroom. This exposure aims to develop competent professionals who understand the social, economic, and administrative factors influencing the operations of industrial organizations.

Course Objectives:

1. Exposure to students to the industrial environment, which cannot be provided in the classroom and hence creating deployable professionals for the industry.
2. Learn to implement the technical knowledge in real industrial situations.

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

CO1	Gain exposure to industry practices and understand how academic concepts are applied in professional settings.
CO2	Develop and demonstrate effective communication and teamwork skills within a work environment.
CO3	Improve your problem-solving and time management skills by working in real-world industry settings.

Internship Requirements

1. **Internship Duration:** It is mandatory for all students to undergo an internship after every semester during vacations for the duration of 3 to 5 weeks. Internships completed during this period will be considered for the assessment of Term Work (TW).
2. **Internship Opportunities:** Students can explore various opportunities for internships at:
    a. Industries
    b. Research labs or organizations
    c. Collegiate clubs
    d. In-house research projects
    e. Online internships
3. **Support and Assistance:** Students can seek assistance for securing internships from:
    a. The Training and Placement cell, along with departmental coordinators
    b. Department or institute faculty members
    c. Personal contacts
    d. Directly connecting with industries or organizations

4. **Request Letter:** Once an industry, research organization, or collegiate club is identified, students must obtain a request letter from the concerned department or placement office. This letter, in the standard format must be duly signed by the authority, should be addressed to the HR manager or relevant authority.
5. **Confirmation Letter:** Students must submit the confirmation letter from the industry, research organization, or collegiate club to the Internship Coordinator and the Head of Department (HOD) office.
6. **Joining Report:** Upon commencing the internship, students must submit the joining report, joining letter, or a copy of the confirmation email to the Internship Coordinator and the HOD office.
7. **Faculty Mentor:** A faculty member will be assigned as a mentor to a group of students. The mentor will be responsible for monitoring, evaluating, and assessing student internship activities. The faculty mentor is also required to visit the internship location and submit formal feedback to the Internship Coordinator.
8. **Faculty Visits:** Faculty members are advised to visit the internship site once or twice during the internship period to monitor progress.
9. **Progress Report:** Students must submit progress report fortnightly to their faculty guide and the final internship report to the Internship Coordinator and department office.
10. **Evaluation Report:** After the completion of the internship, the mentor, along with the assessment panel members, should submit the evaluation report of the students to the department office and the Internship Coordinator.
11. **Internship Certificate:** Students must receive the Internship Certificate from the industry and submit it to the Internship Coordinator and department office.
12. **Presentation and Assessment:** Students are required to give a presentation on their internship work as part of the term work. The internship diary and report will also be verified and assessed.