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 ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Curriculum Structure and Syllabus of

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

(With effect from - Academic Year 2026 - 27)
(2025 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 knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop the solution of complex engineering problems.
PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs

with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8)

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6).

PO6: The Engineer and the World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9).

PO8: Individual and Collaborative Team Work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

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
IE	Internal Evaluation
MTE	Mid Term 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						
25ETPC302	PCC	Digital System Design & Applications	3		-	3	3		3	40	60	-		-	100
25ETPC302P	PCC	Digital System Design & Applications Lab		2				1	1				25		25
25ETPC303	PCC	Network Analysis & Synthesis	3	-	-	3	3	-	3	40	60	-	-	-	100
25ETPC304	PCC	Data Structures & Algorithms	3	-	-	3	3	-	3	40	60	-			100
25ETPC304P	PCC	Data Structures & Algorithms Lab		2				1	1				25		25
25ETMD301	MDM	Engineering Mathematics – III	3	-	-	3	3	-	3	40	60	-	-	-	100
25ALOE301	OE	Open Elective - I#	2	-	-	2	2	-	2	-	-	50		50	100
25ETVS302	VSEC	Problem Solving Technique – I	-	2	-	2	-	1	1	-	-	25	-	-	25
25ETVS303	VSEC	Fundamental of C programing	2	2		4	2	1	3	-	-	25	-	50	75
25ETCC305	CC	Liberal Learning - III	-	2	-	2	-	1	1			25			25
25ETIN301	ELC - INT	Internship – I*	4 Week				-	2	2	-	-	25	-	-	25
Total			**16**	**10**	**-**	**26**	**16**	**07**	**23**	**160**	**240**	**150**	**50**	**100**	**700**

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.

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

# - Select any one course from the given Open Elective Courses		
Course Code	**Course Type**	**Open Elective - I**
25ALOE301A	OEC	Digital Literacy and Applications
25ALOE301B		Environmental Studies
25ALOE301C		Green Energy and Sustainability
25ALOE301D		Basics of Consumer Electronics
25ALOE301E		Renewable Energy Systems

*** Liberal Learning – III: Choose any one from the following:**

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	25ETCC305A	Guitar	6.	25ETCC305F	Basketball
2.	25ETCC305B	Singing	7.	25ETCC305G	Cricket
3.	25ETCC305C	Cinematography	8.	25ETCC305H	Rifle and Pistol Shooting
4.	25ETCC305D	Dance	9.	25ETCC305I	Volleyball
5.	25ETCC305E	Synthesizer	10.	25ETCC305J	Football

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Director

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						
25ETPC405	PCC	Communication Systems	3	-	-	3	3		3	40	60	-	-		100
25ETPC405P	PCC	Communication Systems Lab		2		2		1	1				25		25
25ETPC406	PCC	Signals and Systems	3	-	-	3	3		3	40	60	-	-		100
25ETPC407	PCC	Linear Integrated Circuits	3	-	-	3	3		3	40	60	-	-	-	100
25ETPC407P	PCC	Linear Integrated Circuits Lab		2		2		1	1				25		25
25ETMD402	MDM	Principles of AI and ML	3	-	-	3	3	-	3	40	60	-	-	-	100
25ALOE402	OE	Open Elective - II #	2	-	-	2	2	-	2			50	-	50	100
25ETMC402	HSSM-MC	Project Management System - I	-	2	-	2	-	1	1			25		-	25
25ETAE402	AEC	Problem Solving Technique - II	-	2	-	2	-	1	1			25		-	25
25ETVS404	VSEC	Object Oriented Programing Lab	1	2	-	3	1	1	2			25	25		50
25ETCC406	CC	Liberal Learning - IV		2		2		1	1			25			25
25ETIC402	ELC - INT	Internship - II*	4 Weeks				-		2			25			25
Total			**14**	**12**	**-**	**27**	**14**	**08**	**23**	**160**	**240**	**175**	**75**	**50**	**700**

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

# - Select any one course from the given Open Elective Courses		
Course Code	**Course Type**	**Open Elective - II**
25ALOE402A	OEC	Cyber Security and Laws
25ALOE402B		Sustainability and Climate Change
25ALOE402C		Energy Audit and Electrical Safety
25ALOE402D		Digital Marketing
25ALOE402E		Entrepreneurship and Innovations

*** Liberal Learning – IV: Choose any one from the following:**

Sr. No.	Course Code	Module	Sr. No.	Course Code	Module
1.	25ETCC406A	Guitar	6.	25ETCC406F	Basketball
2.	25ETCC406B	Singing	7.	25ETCC406G	Cricket
3.	25ETCC406C	Cinematography	8.	25ETCC406H	Rifle and Pistol Shooting
4.	25ETCC406D	Dance	9.	25ETCC406I	Volleyball
5.	25ETCC406E	Synthesizer	10.	25ETCC406J	Football

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3	25ETPC303	Network Analysis & Synthesis	
4	25ETPC304	Data Structures & Algorithms	
5	25ETPC304P	Data Structures & Algorithms Lab	
6	25ETMD301	Engineering Mathematics – III	
7	25ALOE301	Open Elective - I#	
8	25ETVS302	Problem Solving Technique – I	
9	25ETVS303	Fundamental of C programing	
10	25ETCC305	Liberal Learning - III	
11	25ETIN301	Internship – I*	
Second Year B. Tech. : Semester - IV			
1	25ETPC405	Communication Systems	
2	25ETPC405P	Communication Systems Lab	
3	25ETPC406	Signals and Systems	
4	25ETPC407	Linear Integrated Circuits	
5	25ETPC407P	Linear Integrated Circuits Lab	
6	25ETMD402	Principles of AI and ML	
7	25ALOE402	Open Elective - II #	
8	25ETMC402	Project Management System - I	
9	25ETAE402	Problem Solving Technique - II	
10	25ETVS404	Object Oriented Programing Lab	
11	25ETCC406	Liberal Learning - IV	
12	25ETIC402	Internship - II*	

SYLLABUS

SEMESTER - III

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** III
Course: Digital Systems Design & Applications									**Code:** 25ETPC302
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

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, Registers: Buffer registers, Shift registers (SISO, SIPO, PISO, PIPO) Counters: Asynchronous and Synchronous Counters, Ring counter, Johnson counter,	07

	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	06
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.	06
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.	06
	TOTAL	**39**
	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/117106086 2. 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 3. Unit 6 – Introduction to VLSI & Verilog, HDLBits – Verilog Practice Problems (Beginner to Advanced), https://hdlbits.01xz.net/wiki/Main_Page

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** III	
Course: Digital Systems Design & Applications Lab								**Code:** 25ETPC302P	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
	02	-	01	-	-	-	-	25	25

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 develop the ability to design and implement basic combinational and sequential digital circuits.
2. To provide practical understanding of logic gates, flip-flops, counters, multiplexers, and related digital building blocks.
3. To introduce hardware implementation and modeling of digital circuits using FPGA and Verilog.

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

CO1	Design and implement code converters, adders, comparators, and parity circuits using basic and universal logic gates.
CO2	Realize Boolean functions using combinational logic devices such as multiplexers and demultiplexers.
CO3	Analyze and verify the characteristics and operation of different flip-flops including SR, JK, D, and T flip-flops.
CO4	Design and implement synchronous and asynchronous counters and sequence generators/detectors.
CO5	Implement and test digital circuits using standard digital ICs and analyze their practical operation.
CO6	Develop and implement basic digital circuits using FPGA and Verilog-based modeling techniques.

Course Contents:

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 a. https://nptel.ac.in/courses/117106086 2. Unit 4 – Programmable Logic Devices (PLDs), TutorialsPoint – Programmable Logic Devices (ROM, PLA, PAL), a. https://www.tutorialspoint.com/digital_circuits/digital_circuits_programmable_logic_devices.htm 3. Unit 6 – Introduction to VLSI & Verilog, HDLBits – Verilog Practice Problems (Beginner to Advanced), https://hdlbits.01xz.net/wiki/Main_Page

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** III
Course: Network Analysis and Synthesis									**Code:** 25ETPC303
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	07

	Network Functions: Diving point, Transfer: voltage and current.	
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.	06
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)	06
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.	06
	TOTAL	**39**
	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. NPTEL Coursse on Network Analysis by IIT Kharagpur https://nptel.ac.in/courses/108105159

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** III
Course: Data Structures and Algorithms									**Code:** 25ETPC304
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

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 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.	07
2.	**Sorting and Searching techniques:** Sorting and Searching techniques: Introduction, Sorting, Insertion Sort, Selection Sort, Bubble Sort, Merge-Sort, Linear search and Binary Search.	07
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.	06

	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.	
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	07
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.	06
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.	06
	TOTAL	**39**
	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/	

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** III
Course: Data Structures and Algorithms Lab									**Code:** 25ETPC304P
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	-	25	-	25

Prerequisites:

Fundamental knowledge of C programming is required.

Course Objectives:

1. To develop programming skills for implementing fundamental data structures and algorithms using C.
2. To provide practical understanding of searching, sorting, linked lists, stacks, queues, trees, and graphs.
3. To develop problem-solving skills using recursion, dynamic data structures, and algorithmic techniques.

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

CO1	Implement and analyze searching and sorting algorithms for solving basic data processing problems.
CO2	Develop programs for sparse matrix representation and perform associated matrix operations.
CO3	Implement dynamic data structures using linked lists and perform insertion, deletion, traversal, and recursive operations.
CO4	Design and implement stack and queue data structures to solve computational problems such as postfix expression evaluation.
CO5	Apply recursion to solve problems such as the Tower of Hanoi and other recursive computational tasks.
CO6	Implement and perform traversal operations on non-linear data structures such as trees and graphs.

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. **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:
	3. Alfred V. Aho, Jeffery D. Ullman, "Data Structures & Algorithms", Person. 4. 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: 3. https://nptel.ac.in/courses/106/102/106102064/ 4. http://cse01-iiith.vlabs.ac.in/

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** III	
Course: Engineering Mathematics – III								**Code:** 25ETMD301	
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 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.	07
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.	07
	Z- Transforms: Definition, Properties of Z-transform, Z- transform of Standard Sequences. Inverse Z-transform, Solution of difference equation by Z-transform.	06

3.		
4.	**Laplace Transform:** Definition and properties of Laplace transform, Inverse Laplace transform, Applications of Laplace transform to solve differential equation.	07
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.	06
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.	06
	TOTAL	**39**
	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/111105123 2. NPTEL Course "Probability Theory and Applications, https://nptel.ac.in/courses/111102160	

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OPEN ELECTIVE - I

(Select any one course from the given Open Elective Courses)

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Common to all Programs)							**Semester:** III		
Course: Open Elective – I (Digital Literacy and Applications)							**Code:** 25ALOE301A		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	-	-	02	-	-	50	50	-	100

Prerequisites:

Basic computer knowledge, Familiarity with using internet and mobile devices

Course Objectives:

1. To introduce students to fundamental digital skills and online applications.
2. To enhance understanding of modern information and communication technologies (ICT).
3. To develop practical skills in digital tools, online collaboration, and data management.
4. To promote safe, ethical, and effective use of technology in professional and personal life.

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

CO1	Demonstrate proficiency in using essential digital tools for everyday tasks.
CO2	Apply safe and secure practices while using the internet and online services.
CO3	Utilize online collaboration platforms for communication and teamwork.
CO4	Develop simple digital content (documents, presentations, basic websites).
CO5	Leverage emerging digital applications for academic, professional, and social needs.
CO6	Create a simple web application and explain emerging technologies in everyday life.

Course Contents:

Unit	Description	Duration (Hrs.)
1.	**Introduction to Digital Literacy**: Evolution of Digital Technology – Role of ICT in modern life – Hardware and Software basics – Overview of digital devices (Computers, Smartphones, Tablets) – Operating Systems and Applications.	04
2.	**Internet and Web Fundamentals:** Basics of Internet – Web Browsers – Search Engines – Online Communication Tools (Email, Chat, Video Conferencing) – Netiquette – Cloud Storage and File Sharing.	04
3.	**Digital Tools for Productivity:** Word Processing (MS Word/Google Docs) – Spreadsheet Fundamentals (MS Excel/Google Sheets) – Presentation Tools (PowerPoint/Canva) – Templates and Online Collaboration (Google Workspace, MS Teams).	05
4.	**Cyber Safety and Digital Ethics:** Online Security Threats – Password Management – Safe Browsing – Data Privacy	05

	– Cyberbullying – Digital Footprint – Intellectual Property Rights in the digital era.	
5.	**Social media and Online Applications:** Role of social media in Communication – Online Professional Networking (LinkedIn) – Blogging and Content Sharing Platforms – Basics of Digital Marketing – E-Governance and Online Services (Banking, Payments, Education Portals).	04
6.	**Introduction to Web and Mobile Applications**: Creating a Simple Blog/Portfolio Website (Using WordPress/Wix) – Overview of Mobile Apps for Education and Productivity – Emerging Technologies (Cloud Computing, IoT, AI) in everyday life.	04
	TOTAL	**26**

Text Books:

1. Pradeep K. Sinha, Priti Sinha, "Computer Fundamentals", BPB Publications.
2. Rajaraman, "Fundamentals of Computers", PHI Learning.

Reference Books:

1. Alan Evans, Kendall Martin, Mary Anne Poatsy, "Technology in Action", Pearson Education.
2. Daniel Scott, "Digital Literacy Unpacked", Facet Publishing.

E-Resources:

1. NPTEL: https://nptel.ac.in
2. Digital Literacy Course, Google: https://learndigital.withgoogle.com
3. Microsoft Learn: https://learn.microsoft.com
4. W3Schools Basics: https://www.w3schools.com

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Common to all Programs)									**Semester:** III
Course: Open Elective – I (Environmental Studies)									**Code:** 25ALOE301B
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	-	-	02	-	-	50	50	-	100

Course Objectives:

1. To understand the structure and functions of ecosystems and the importance of biodiversity.
2. To study advanced energy systems and their role in sustainable development.
3. To learn concepts of natural resource management and disaster management through case studies.
4. To understand sources, impacts, and control measures of environmental pollution and waste management.
5. To create awareness about global environmental issues and environmental toxicology.
6. To gain knowledge of environmental assessment, management systems, and pollution control tools.

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

CO1	Understand the structure and functions of major ecosystems and the significance of biodiversity conservation
CO2	Evaluate various advanced energy systems in terms of their merits, demerits, and global applications
CO3	Apply concepts of natural resource management and disaster management using relevant case studies.
CO4	Analyse the sources, impacts, and control measures of environmental pollution and waste management practices.
CO5	Assess global environmental concerns and suggest sustainable solutions for issues like climate change and groundwater depletion.
CO6	Utilize environmental management tools and prepare environmental impact assessments following legislative guidelines.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Ecosystems** (Structure and Function): Forest, Desert, Wetlands, River, Oceanic and Lake. Biodiversity: Types, Value, Hot-spots, Threats and Conservation of biodiversity, Forest Wealth and Deforestation.	05

2.	**Advances in Energy Systems** (Merits, Demerits, Global Status and Applications): Hydrogen, Solar, OTEC, Tidal and Wind. Natural Resource Management (Concept and case-studies): Disaster Management, Sustainable mining, case studies, and Carbon Trading.	04
3.	**Environmental Pollution** (Sources, Impacts, Corrective and Preventive measures, Relevant Environmental Acts, Case-studies): Surface and Groundwater Pollution, Noise pollution, Soil Pollution and Air Pollution. **Waste Management & Public Health Aspects**: Bio-medical Wastes, Solid waste, Hazardous wastes, E-wastes, Industrial and Municipal Sludge.	05
4.	**Global Environmental Concerns** (Concept, policies and case-studies): Groundwater depletion/recharging, Climate Change, Acid Rain, Ozone Depletion, Radon and Fluoride problem in drinking water, Resettlement and rehabilitation of people, Environmental Toxicology.	03
5.	**Latest Developments in Environmental Pollution Mitigation Tools** (Concept and applications): G.I.S. & Remote Sensing, Environmental Management Systems, ISO14001, Environmental Stewardship- NGOs.	04
6.	**Environmental Assessment, Management and Legislation** Aims and objectives of Environmental Impact Assessment (EIA), Environmental Impact Statement (EIS). EIA Guidelines, Impact Assessment Methodologies, Procedure for reviewing EIA of developmental project, Life-cycle analysis, cost benefit analysis, Guidelines for Environmental Audit.	05
	TOTAL	**26**

Text Books:

1. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T., "Environmental Encyclopedia", Jaico Publications House, 1st edition, 2000.
2. Agarwal, K.C, "Environmental Biology", Nidhi Publishers, 2nd edition, 2008.

Reference Books:

1. Erach Bharucha, "The Biodiversity of India", Mapin Publishing Pvt. Ltd., 1st Edition, 2002.
2. Brendan Gleeson and Nicholas Low (Eds.), "Global Ethics and Environment", Routledge, London, 1999.
3. Peter H. Gleick, "Water in Crisis", Pacific Institute for Studies in Development, Environment & Security, Stockholm Environment Institute, Oxford University Press, 1993.
4. Martha J. Groom, Gary K. Meffe, and Carl Ronald Carroll, "Principles of Conservation Biology", Sinauer Associates, Sunderland, 2006.
5. R. Edward Grumbine and M. K. Pandit, "Threats from India's Himalaya Dams", Science, Vol. 339, pp. 36–37, 2013.
6. Patrick McCully, "Rivers No More: The Environmental Effects of Dams", pp. 29–64, Zed Books, 1996.

E-Resources:
1. NPTEL video lecture on Environmental Impact Assessment https://www.youtube.com/watch?v=_iLdyhgFv1U 2. Sustainability Concepts - Innovations and Challenges https://www.youtube.com/watch?v=A9PGRnkLubE&list=PLbRMhDVUMngd2-jPdQSk3QNBTf2n7FxXU&index=2 3. Natural Resources Management https://www.youtube.com/watch?v=vsXv3anIBSU&list=PLwdnzlV3ogoV162m7Q1rCQamsvKWT9D08 4. Biodiversity & conservation https://www.youtube.com/watch?v=eJBfZGEzUfA&list=PLwdnzlV3ogoV162m7Q1rCQamsvKWT9D08&index=9

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Common to all Programs)							**Semester:** III		
Course: Open Elective – I **(**Green Energy and Sustainability)							**Code:** 25ALOE301C		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	-	-	02	-	-	50	50	-	100

Prerequisites:

Renewable energy, power generation technology

Course Objectives:

1. To study cleaner production and life cycle assessment.
2. To understand green fuels.
3. To learn green technology and green engineering.
4. To learn waste management.
5. To study sustainable technologies.

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

CO1	Understand green technology principles, green chemistry, and process intensification for sustainable industries.
CO2	Evaluate the benefits, challenges, and environmental impact of green fuels compared to conventional fossil fuels.
CO3	Apply cleaner production principles and life cycle assessment for sustainability.
CO4	Assess waste types, audits, and management strategies with focus on health and environmental impact.
CO5	Explain sustainable technologies considering ecological, economic, and social dimensions.
CO6	Analyze practical challenges, case studies, and laws in implementing green technologies.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Principles of Green Technology and Green Engineering:** Processes and products for green safe and economically acceptable to the society, green chemistry and Process intensification. **Green Industrial Processes:** Pollution statistics from various industries. A greener approach towards all these industries.	05
2.	**Green Fuels:** Definition of Green Fuels, their benefits and challenges, comparison of green fuels with conventional fossil fuels with reference to environmental, economic and social impacts, public policies and market driven initiatives, Biomass	05

	energy: Concept of biomass energy utilization, types of biomass.	
3.	**Cleaner Production:** Definition, Importance, Principles of Cleaner Production and its Benefits, Role of industry, Clean development mechanism, Reuse, Recovery, Recycle, Raw material substitution- Wealth from waste. Role of CP in Achieving Sustainability, Benefits, Role of Industry, Government and Institutions, Environmental Management, Pollution Prevention and Cleaner Production Awareness Plan, Environmental Statement, Carbon credit, Carbon trading. Introduction to Life Cycle Assessment (LCA) and Elements of LCA.	04
4.	**Waste Management:** Waste stream assessment (WSA), Waste generation and composition, Waste characteristics (physical and chemical), Waste audit, Health and Environmental effects (public health and environmental), Comparative assessment of waste generation and Composition of developing and developed nations, a case study results from an Indian city, Handouts on solid waste compositions. E-waste generation.	04
5.	**Sustainable Technology:** Understand the Sustainable Technology, Three principle dimensions: the ecological, the economic and the social dimension, including intergenerational justice; use a systems perspective, to describe sustainability challenges and possibilities for major technical systems and for their transformation to meet sustainability requirements.	04
6	**Challenges and Practical Implementation:** Responsibilities and potentials of companies for action. Green Productivity and emerging technologies. Implementation of the practical applications of Green emerging technologies and sustainable development. Case studies in Green Technology. Green laws compliance.	04
	TOTAL	**26**

Text Books:

1. Matlack A.S., "Introduction to Green Chemistry", Marcel Dekker Publication.
2. Modak P., Visvanathan C. and Parasnis M., "Cleaner Production Audit Environmental System Reviews", Asian Institute of Technology Publication.
3. Anastas P.T. and Warner J.C., "Green Chemistry: Theory and Practice", Oxford University Press.
4. Bishop P. L., "Pollution Prevention: Fundamentals and Practice", McGraw-Hill Publication, Boston.
5. Clark J.H. and Macquarie D.J., "Handbook of Green Chemistry and Technology", Wiley Blackwell Publication.

Reference Books:

1. Sawyer C.N, McCarty P.L and Parkin G.F., "Chemistry for Environmental Engineering and Science", 5th ed. McGraw-Hill Professional Publication.
2. Paul L Bishop, "Pollution Prevention: Fundamentals and practice", McGraw-Hill International Publication.
3. Das A. K, "Environmental Chemistry with Green Chemistry", Books and Allied (P) Ltd. Publication.
4. V.K. Ahluwalia, "Green Chemistry Environmentally Benign Reactions", springer publication.
5. V.K. Ahluwalia, Ane. "Green Chemistry: Environmentally Benign Reactions", springer publication.
6. Mike Lancaster, "Green Chemistry: An Introductory Text", Royal Society of Chemistry publication.

E-Resources:

1. NPTEL Course on "Energy Resources, Economics and Sustainability", By Prof. Pratham Arora, IIT Roorkee, https://onlinecourses.nptel.ac.in/noc25_hs86/preview
2. NPTEL Course on "Sustainable Energy Technology", By Prof. Sayak Banerjee, IIT Hyderabad. https://onlinecourses.nptel.ac.in/noc23_me138/preview

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Common to all Programs)							**Semester:** III		
Course: Open Elective – I (Basics of Consumer Electronics)							**Code:** 25ALOE301D		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	-	-	02	-	-	50	50	-	100

Prerequisites:

Basic understanding current, voltage, and electronics components

Course Objectives:

1. Understand principles and components of audio, video, and communication systems.
2. Develop practical skills in installation, operation, and maintenance of electronics.
3. Prepare students for technical roles in electronics service and support industry.

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

CO1	Understand the working principles and components of basic audio systems and home theatre setups.
CO2	Explain the functioning of modern video display technologies and remote-control operations.
CO3	Identify and describe the types, specifications, and working of projectors and CCTV systems.
CO4	Describe satellite communication principles and DTH system setup and components.
CO5	Explain the construction, working, and common issues in basic household appliances like washing machines, mixers, and induction cooktops.
CO6	Understand the operation and features of kitchen and office equipment such as microwave ovens, printers, and scanners.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Audio Systems**: Introduction to audio systems, Audio amplifier, Microphone, Loudspeaker, Public address system, DJ system: concept and components, Audio as Data and Signal, Digital Audio Processes: Time Compression & Expansion, Block diagram and working of home theatre system	05
2.	**Video Systems and Display Technologies**: Elements of TV communication system, Scanning process and its necessity, Comparison: CRT, LCD, and LED TVs, LCD and LED TV: principles and section-wise working, 3D TV: Basic working principle, IPS panels and features, Interfaces: HDMI, USB, RGB, etc., TV remote control: types, IR code transmission/reception, functions, faults	05
3.	**Projectors and Surveillance Systems:**	04

	LCD vs. LED Projectors: differences and specs, Working principle and faults in LED projectors, CCTV Cameras: types and specifications, CCTV setup and components, Digital Video Recorders: types and working	
4.	**Satellite Communication and DTH Technology**: Basics of satellite communication, Merits, demerits, and applications, Satellite types, orbits, frequency bands, Components of DTH: PDA, LNBC, satellite receiver, dish alignment, Cable types, impedance, MDU design, Set Top Box: block diagram, features, I/O ports, Cable modem termination system, software, CPE	04
5.	**Domestic Appliances – Part I:** Washing Machines: types, parts, block diagrams, timers, motors, Vacuum Cleaner: block diagram, working, features, motors, circuits, Mixer/Grinder: parts, speed control, auto overload protection, Electric Iron & Steam Iron: principle, thermostat, parts, Water Purifiers: RO/UV principles, components, faults, Immersion Heater: working, insulation, Induction Cooktop: principle, tubes, heat sinking, fault identification	04
6.	**Domestic Appliances – Part II and Office Equipment:** Microwave Oven: types, block & wiring diagram, microwave generation, Food Processors: parts and working, Printers: dot matrix, inkjet, laser; advantages, disadvantages, connectivity, Digital Electronic Lock, Xerox Machine, Scanner, Fax Machine	04
	TOTAL	**26**

Text Books:

1. S. P. Bali, "Consumer Electronics", 1st Edition, Paperback, English.
2. B. R. Gupta, "Consumer Electronics", Paperback, English.
3. Dr. J. S. Chitode, "Consumer Electronics – A Conceptual Approach".
4. Douglas Kinney, "A Beginner's Guide to Consumer Electronics Repair: Handbook and Tutorial".
5. Anand, "Consumer Electronics".
6. H. Davidson, "Troubleshooting Consumer Electronics Audio Circuits".

Reference Books:

1. Dennis Roddy, "Satellite Communications", McGraw Hill.
2. R. G. Gupta, "Audio Video Systems – Principles, Maintenance and Troubleshooting", Tata McGraw-Hill.
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press.
4. S. P. Sharma, "Appliance Servicing and Repair Guide", Katson Books

E-Resources:

1. Audio System Engineering (IIT Kharagpur),
   Course page: https://nptel.ac.in/courses/117/105/117105133

2. Satellite Communication & DTH NOC: Satellite Communication Systems (IIT Kharagpur) Course page: https://archive.nptel.ac.in/courses/117/105/117105131/

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Common to all Programs)							**Semester:** III		
Course: Open Elective – I (Renewable Energy Systems)							**Code:** 25ALOE301E		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	-	-	02	-	-	50	50	-	100

Prerequisites:

Fundamentals of Mechanical Engineering, Physics, Thermodynamics

Course Objectives:

1. Discuss the global and national energy scenarios and environmental impacts and sustainability concerns associated with fossil fuel use.
2. Identify and explain the working principles of solar radiation measuring instruments including pyrheliometers, pyranometers, and sunshine recorders.
3. Classify various types of wind-mills and describe their structural components.
4. Introduce biomass as an energy source and describe biomass conversion technologies.
5. Describe the construction, working, and applications of various renewable energy sources.

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

CO1	Identify and describe the main types of renewable energy sources and their respective limitations.
CO2	Compare various types of solar collectors based on design and performance.
CO3	Identify and explain factors affecting wind characteristics and wind energy generation.
CO4	Interpret the advantages and limitations of biomass energy in comparison with other renewable sources.
CO5	Apply energy conversion principles to assess the feasibility of alternative energy systems.
CO6	Compare the suitability of renewable energy technologies (like fuel cells) for specific applications.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to Renewable Energy:** Environmental consequence of fossil fuel, Limits Of Fossil Fuel, Energy Scenario, Classification of Energy Sources, types of renewable energy sources, limitations.	04
2.	**Solar Energy:** Environmental impacts of solar energy, Solar radiation measurements, Solar constant, Solar Radiation Measuring Instruments (Radiometers): Pyrheliometers, Pyranometers, Sunshine recorder, classification of solar collectors	05
3.	**Wind Energy:**	04

	Factors affecting the wind, Classification of Wind-mills, Main Components of a wind-mill, wind speed prediction, Advantages of Fixed and variable speed systems,	
4.	**Biomass Energy:** Introduction, Biomass Conversion, Types of biogas plants: Floating dome type, Fixed dome type, Biodiesel, Significance of biodiesel	04
5.	**Other Forms of Renewable Energy Sources**: Introduction, hydro energy, geothermal energy, wave & tidal energy, Energy Conversion Principles, Environmental considerations	04
6.	**Applications of Renewable Energy Sources**: Photovoltaic (PV) cell, Solar water heater, Crop And Grain Drying, Space And Water Heating, Solar Energy Applications for Agriculture, Fuel Cell	05
	TOTAL	**26**

Text Books:

1. S. P. Sukhatme and J. K. Nayak, "Solar Energy: Principles of Thermal Collection and Storage", 3rd Edition, Tata McGraw-Hill Education Pvt. Ltd., 2008.
2. J. Twidell and Tony Weir, "Renewable Energy Resources", 2nd Edition, Taylor & Francis, 2006.
3. B. H. Khan, "Non-Conventional Energy Resources", 2nd Edition, Tata McGraw-Hill Education Pvt. Ltd., 2009.
4. Prabir Basu, "Biomass Gasification, Pyrolysis and Torrefaction", Academic Press, Elsevier, 2013.

Reference Books:

1. O. P. Gupta, "Energy Technology", Khanna Book Publishing, New Delhi.
2. V. V. N. Kishore, "Renewable Energy Engineering and Technology: Principles and Practice", Routledge, 1st Edition, 2019.
3. N. Jenkins and J. Ekanayake, "Renewable Energy Engineering", Cambridge University Press, 1st Edition, 2017.
4. G. Boyle, "Renewable Energy", OUP Oxford, 2nd Edition, 2009.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ph44/preview
2. https://nptel.ac.in/courses/103103206
3. https://onlinecourses.swayam2.ac.in/nou22_ge71/preview
4. https://www.coursera.org/specializations/renewable-energy
5. https://www.coursera.org/learn/exploring-renewable-energy
6. https://www.youtube.com/watch?v=VfowJHJz6-s

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** III	
Course: Problem Solving Techniques - I								**Code:** 25ETVS302	
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.

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics & Telecommunication Engineering)								**Semester:** III	
Course: Fundamentals of C programing								**Code:** 25ETVS303	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	02	-	03	-	-	25	50	-	75

Prerequisites:

Basic computer knowledge, Fundamentals of mathematics and logic, Familiarity with operating systems and text editors

Course Objectives:

1. To introduce fundamental concepts of structured programming using C.
2. To develop problem-solving skills through algorithms and flowcharts.
3. To implement decision-making and iterative programming techniques.
4. To apply arrays, strings, pointers and structures in engineering applications.
   To develop modular programs using functions and file handling..

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

CO1	Understand the fundamentals of C programming language.
CO2	Develop algorithms and implement structured programs.
CO3	Apply decision-making and looping constructs for problem solving.
CO4	Implement arrays, strings and functions in C programs.
CO5	Utilize pointers, structures and file handling concepts.
CO6	Develop efficient programs for Electronics and Telecommunication applications.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to C Programming:** Problem solving concepts, algorithms, flowcharts, history and features of C, structure of C program, compilation and execution process, character set, tokens, keywords, identifiers, variables and constants.	04
2.	**Data Types, Operators and Input/Output:** Data types, declaration and initialization of variables, symbolic constants, arithmetic, relational, logical and assignment operators, operator precedence and associativity, formatted input/output functions (printf(), scanf()).	05
3.	**Decision Making and Looping:** if, if-else, nested if-else, switch statement, while loop, do-while loop, for loop, break and continue statements, simple engineering applications using loops.	05

4.	**Functions and Arrays:** Function declaration, definition and calling, call by value, recursive functions, user-defined functions, one-dimensional arrays, two-dimensional arrays, searching and sorting techniques.	05
5.	**Strings, Pointers and Structures:** String declaration and initialization, string handling functions, pointer declaration and initialization, pointer arithmetic, pointers with arrays and functions, structures, nested structures and unions.	05
6.	**File Handling and Electronics Applications:** File opening modes, text and binary files, file read/write operations, simple applications related to embedded systems	04
	TOTAL	**26**
	List of Experiments:	
	Any 8 experiments 1. Write, compile, and execute a simple C program to display "Hello World" and understand the structure of a C program. 2. Develop C programs using variables, constants, and different data types to perform basic arithmetic calculations. 3. Implement programs using arithmetic, relational, logical, and assignment operators to evaluate expressions and demonstrate operator precedence. 4. Write programs using printf() and scanf() for formatted input and output (e.g., simple calculator, unit conversion) 5. Develop programs using decision-making statements (if, if-else, nested if-else, and switch) for applications such as grading system, menu-driven calculator, or maximum of three numbers. 6. Implement programs using looping constructs (for, while, do-while) to generate multiplication tables, factorial, Fibonacci series, and prime numbers. 7. Write programs demonstrating the use of break and continue statements in loop-based engineering applications. 8. Develop user-defined functions to perform mathematical operations and demonstrate call by value. 9. Implement recursive functions for factorial, Fibonacci series, and Tower of Hanoi (optional advanced example). 10. Write programs using one-dimensional arrays to perform searching (Linear Search, Binary Search) and sorting (Bubble Sort/Selection Sort). 11. Develop programs using two-dimensional arrays for matrix addition, subtraction, multiplication, and transpose. 12. Write programs using strings to perform operations such as length calculation, concatenation, comparison, reversal, and palindrome checking using library functions and user-defined functions. 13. Implement programs demonstrating pointers, pointer arithmetic, pointers with arrays, and passing pointers to functions. 14. Develop programs using structures, nested structures, and unions to store and process student or electronic component information. 15. Write programs for file handling to create, read, append, and update text/binary files,	

	including a simple electronics application such as storing and retrieving sensor readings or electronic component inventory.
	Text Books:
	1. E. Balagurusamy, Programming in ANSI C, McGraw Hill. 2. Yashavant Kanetkar, Let Us C, BPB Publications. 3. Byron Gottfried, Programming with C, Schaum Series.
	Reference Books
	1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Pearson Education. 2. Herbert Schildt, C: The Complete Reference, McGraw Hill. 3. Reema Thareja, Programming in C, Oxford University Press.
	E-Resources:
	1. Geeks for Geeks C Programming – https://www.geeksforgeeks.org/c-programming-language/ 2. Tutorials Point C Tutorial – https://www.tutorialspoint.com/cprogramming/index.htm 3. NPTEL course on Introduction to programming in C, IIT Kanpur 4. https://nptel.ac.in/courses/106104128

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Liberal Learning - III

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** III		
Course: Liberal Learning – III (Guitar)							**Code:** 25ETCC305A		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music and Guitar musical instrument.

Course Objectives:

1. To develop advanced guitar techniques, including scales, arpeggios, fingerstyle, and lead guitar skills.
2. To strengthen students' understanding of music theory, chord construction, harmony, improvisation, and melodic phrasing.
3. To enhance ensemble performance, stage confidence, musical communication, and readiness for intermediate-level performances.

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

CO1	Perform advanced scales, arpeggios, chord progressions, and fingerstyle techniques with accuracy.
CO2	Apply music theory concepts in lead guitar playing, improvisation, and melodic expression.
CO3	Demonstrate confident solo and ensemble performances with effective musical expression and stage readiness.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Revision of Semester II concepts, Warm-up & Finger Independence	2
2.	Major & Minor Scale Revision (Two Octaves)	2
3.	Pentatonic Scales & Blues Scale	2
4.	Arpeggios and Picking Exercises	2

5.	Chord Construction & Extended Chords (7th, Maj7, m7)	2
6.	Chord Progressions in Different Keys	2
7.	Fingerstyle Techniques – Patterns & Independence	2
8.	Lead Guitar Techniques – Hammer-ons, Pull-offs, Slides	2
9.	Improvisation using Pentatonic Scale	2
10.	Genre-based Playing (Blues, Rock, Pop)	2
11.	Ensemble Playing & Rhythm Coordination	2
12.	Solo Performance Practice & Individual Corrections	2
13.	Mock Performance & Stage Preparation	2
	TOTAL	**26**

Text Books:

1. Hal Leonard Corporation, "Hal Leonard Guitar Method – Complete Edition", Hal Leonard Publications.
2. Mel Bay, "Modern Guitar Method – Grades 1, 2 & 3", Mel Bay Publications.
3. William Leavitt, "A Modern Method for Guitar (Books 1–3)", Berklee Press.
4. Richard Chapman, "The Complete Guitar Manual", DK Publishing.
5. Ralph Denyer, "The Guitar Handbook", Knopf Publishing..

Reference Books:

1. Troy Stetina, "Fretboard Mastery", Hal Leonard Publications.
2. Tom Kolb, "Music Theory for Guitarists", Hal Leonard Publications.
3. Don Latarski, "Practical Theory for Guitar", Alfred Music.
4. Bruce Buckingham, "Scales and Modes for Guitar", Hal Leonard Publications.
5. Mark Phillips and Jon Chappell, "Guitar For Dummies", Wiley Publishing.

E-Resources:

1. **Berklee Online** – Guitar lessons, music theory, ear training, and performance resources. https://online.berklee.edu
2. **Justin Guitar** – Structured guitar lessons from beginner to advanced. https://www.justinguitar.com
3. **Fender Play** – Interactive lessons on chords, scales, techniques, and songs. https://www.fender.com/play

4. **TrueFire** – Professional online guitar courses covering multiple genres and techniques. https://truefire.com
5. **Ultimate Guitar** – Tabs, chord charts, scales, and community resources. https://www.ultimate-guitar.com
6. **MuseScore** – Free music notation software and sheet music library. https://musescore.org
7. **MusicTheory.net** – Interactive music theory lessons and exercises. https://www.musictheory.net
8. **Yamaha Music India** – Educational resources on guitar fundamentals and musicianship. https://in.yamaha.com

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** III		
Course: Liberal Learning – III (Singing)							**Code:** 25ETCC305B		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music in singing.

Course Objectives:

1. To develop students' understanding of prescribed ragas and talas through theoretical and practical study.
2. To enhance vocal skills through Alankar practice in Shuddha and Vikrit (Komal) Swaras and different musical forms.
3. To strengthen rhythmic knowledge, musical expression, voice culture, and stage performance skills.

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

CO1	Demonstrate understanding of prescribed ragas, talas, and Alankars through accurate vocal performance.
CO2	Apply rhythmic patterns such as Bhajani Theka and Jhaptal in prescribed vocal compositions.
CO3	Perform festival songs, ghazals, and vocal compositions with proper pitch, voice control, musical expression, and stage confidence.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Detailed Study of Prescribed Ragas: Raga Bageshree ,Raga Des, Raga Khamaj	6
2.	Study of Prescribed Talas: Bhajani Theka, Jhaptal	4
3.	Basic theory concepts	2
4.	Identification of Raga Characteristics and Tala Structure	2

5.	Festival Songs	2
6.	Gazals	2
7.	Soulful / Light Vocal Songs	2
8.	Interpretation and Presentation of Different Song Styles	2
9.	Practice of Ten Alankars in Shuddha/ Komal swaras	2
10.	Alankars based on the Prescribed Ragas	2
	TOTAL	**26**

Text Books:

1. **V. N. Bhatkhande, "Kramik Pustak Malika (Vol. III & IV)", Publications.**
2. **V. D. Paluskar, "Sangeet Bal Prakash", Publications.**

Reference Books:

1. V. N. Bhatkhande, "Hindustani Sangeet Paddhati (Vol. I–IV)", Publications.
2. Ashok Da. Ranade, "Hindustani Music: Tradition in Transition", Publications.
3. S. N. Ratanjankar, "Abhinav Geet Manjari", Publications.

E-Resources:

1. Sangeet Natak Akademi - All India Radio (Akashvani)
2. SwarGanga Music Foundation
3. YouTube – Sangeet Natak Akademi Channel
4. Digital Tanpura and Tabla Applications (e.g., iTanpura, Riyaz, NaadSadhana)

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** III		
Course: Liberal Learning – III (Cinematography)							**Code:** 25ETCC305C		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.

Course Objectives:

1. To identify and operate camera equipment while understanding camera functions and exposure settings.
2. To develop skills in composition, framing, perspective, and lighting techniques.
3. To create visual stories through different photography genres and creative image-making.
4. To apply basic photo editing and post-processing techniques using editing software.

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

CO1	Operate cameras and apply appropriate settings, exposure, and lighting techniques to capture quality photographs.
CO2	Compose visually appealing photographs using principles of composition, design, and creative framing.
CO3	Capture photographs across different genres such as portrait, landscape, product, event, and wildlife photography.

Course Contents:

Sr. No.	Description	Duration (Hrs.)
1.	Introduction to Videography	2
2.	Basics of Video Camera operations	2
3.	Techniques for steady shooting (Tripod, Gimble)	2
4.	Basics shot types (Wide, Medium, Close-up)	2
5.	Basics shot types (Wide, Medium, Close-up)	2
6.	Camera Movement (Pan, Tilt, Roll)	2
7.	Practical	2
8.	Composition Technique - Focus and Depth of field	2
9.	Natural vs artificial lighting	2
10.	Practical	2
11.	Filming Techniques	2
12.	Audio Recording	2

13.	Practical Session	2
	TOTAL	**26**

Text Books:

1. Peterson, B., "Understanding Exposure – Theory + Fundamentals", Amphoto Books.
2. Kelby, S., "The Digital Photography Book – Practical + Shooting", Rocky Nook.

Reference Books:

1. Langford, M., "Langford's Basic Photography – Technical Concepts", Focal Press.
2. Freeman, M., "The Photographer's Eye – Composition, Visual Balance, Framing, Perspective", Ilex Press.

E-Resources:

1. https://www.youtube.com/watch?v=xKRh4PI-BKg
2. https://www.youtube.com/@StudioBinder/videos

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** III		
Course: Liberal Learning – III (Dance)							**Code:** 25ETCC305D		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.

Course Objectives:

1. To strengthen students' technical proficiency through advanced Adavus, Jathis, and rhythmic patterns.
2. To develop expressive skills (Abhinaya) by interpreting simple classical compositions.
3. To enhance coordination, balance, posture, and stage presence through regular practical training.
4. To introduce students to intermediate Bharatanatyam repertoire such as Jatiswaram and improve performance skills.

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

CO1	Demonstrate dance techniques with precision, balance, posture, and rhythmic accuracy.
CO2	Apply musicality, synchronization, expression, and storytelling in solo and group performances.
CO3	Create dance combinations using choreography principles with confidence, creativity, and stage presence.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Introduction to forms and previous year revision	2
2.	Choreography on song/ composition	6
3.	Application and introduction to emotions for better understanding of movements	4
4.	Rhythm and rhythmic movements	6
5.	Introduction to different forms other than the teaching format	2
6.	Insights to choreographies and partner motions in folk forms	4
7.	Mock performance training and presentation with costumes	2
	TOTAL	**26**

Text Books:
1. Bharata Muni, "Natya Shastra", translated by Manomohan Ghosh, Asiatic Society, Kolkata. 2. Nandikeshvara, "Abhinaya Darpana", translated by Manomohan Ghosh. 3. Balasaraswati, T., "Bharatanatyam", Madras Music Academy. 4. Krishna Iyer, E., "Bharatanatyam", Ganesh & Co., Chennai.
Reference Books:
1. Kothari, Sunil, "Bharatanatyam", Marg Publications, Mumbai. 2. Vatsyayan, Kapila, "Classical Indian Dance in Literature and the Arts", Sangeet Natak Akademi. 3. Subramaniam, Padma, "Bharata's Art: Then and Now", Bharata Ilango Foundation. 4. Vatsyayan, Kapila, "Indian Classical Dance", Publications Division, Government of India. 5. Srinivasan, Priya, "Sweating Saris: Indian Dance as Transnational Labor", Temple University Press. 6. Sangeet Natak Akademi, "Bharatanatyam – A Reader", Sangeet Natak Akademi, New Delhi.
E-Resources:
1. https://youtu.be/XONKu803dAk?si=LkLbNKPUvKpfZJkF 2. https://youtu.be/D0Ow529EHSo?si=upTtBpNp1lODzHMq 3. https://youtu.be/JDfYT3Ax7mE?si=Q9VYWj95cnLikw2V 4. https://youtu.be/GcZJMiHds3U?si=AXAMwJ37YuDEVbTF 5. https://youtu.be/2j9KmG25l8g?si=zH9rKV-VY7RPirgD

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** III		
Course: Liberal Learning – III (Synthesizer/Keyboard)							**Code:** 25ETCC305E		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music and Keyboard musical instrument.

Course Objectives:

1. To strengthen students' understanding and practical application of major/minor scales, chords, chord progressions, and inversions.
2. To develop skills in Western Staff Notation, accompaniment techniques, melody integration, and left-hand coordination.
3. To enhance technical proficiency, musical expression, rhythmic accuracy, ensemble coordination, and stage confidence.

Course Outcomes:

CO1	Apply scales, chords, chord progressions, and inversions in keyboard performance.
CO2	Perform musical compositions using Indian and Western Staff Notation with suitable accompaniment techniques.
CO3	Demonstrate technical proficiency, musical interpretation, ensemble coordination, and stage confidence.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Revision of all Major Scales	2
2.	Revision of all Minor Scales (Natural, Harmonic & Melodic)	2
3.	Revision of Major and Minor Chords,	2

4.	Revision of Chord Progression, Family chords, Chords Inversion	2
5.	Playing Simple Songs with Indian Notation	2
6.	Introduction to Staff Notation	2
7.	Understanding the Difference between Indian and Western Staff Notation	2
8.	Reading and Playing Simple Melodies from Staff Notation	2
9.	Playing Songs using Both Indian and Staff Notation	2
10.	Fundamentals of Keyboard Accompaniment	2
11.	Accompaniment using Major and Minor Chords	2
12.	Accompaniment with Scales and Simple Songs	2
13.	Group Performance	2
	TOTAL	**26**

Text Books:

1. Aaron, M., "Michael Aaron Piano Course – Grade 2", Alfred Music.
2. Thompson, J., "John Thompson's Modern Course for the Piano – Second Grade", Willis Music.
3. Hanon, C. L., "The Virtuoso Pianist in Sixty Exercises", G. Schirmer.
4. Agay, D., "Learning to Play Piano – Book 2", Yorktown Press.

Reference Books:

1. Thompson, J., "Modern Course for the Piano", Willis Music.
2. Aaron, M., "Piano Course", Alfred Music.
3. Hanon, C. L., "The Virtuoso Pianist", G. Schirmer.
4. Harrison, M., "Contemporary Music Theory", Hal Leonard.
5. ABRSM, "Music Theory in Practice (Grades 1–5)", Associated Board of the Royal Schools of Music.

E-Resources:

1. https://www.youtube.com/watch?v=5nA245TZvBY
2. https://www.youtube.com/watch?v=h4YGP7GyZNU&list=PLUPHIkAcHm-SvoAmFIkec2STxRdvJnYYF

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** III		
Course: Liberal Learning – III (Basketball)							**Code:** 25ETCC305F		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop fundamental basketball skills, physical fitness, teamwork, and understanding of rules and strategies to enable effective participation and performance in the game.

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

CO1	Demonstrate basic basketball skills such as dribbling, passing, shooting, and defensive fundamentals effectively.
CO2	Apply offensive and defensive strategies, including transition play, during gameplay and scrimmages.
CO3	Understand and implement basketball game rules and referee gestures accurately in practical situations.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	**Fundamentals Skill Review:** Refresh all core basketball skills. Perform all basic techniques confidently.	2
2.	**Skill Circuit:** Practice all basic skills in rotation. Improve overall basketball fundamentals.	2
3.	**Small Group Practice:** Apply skills in partner and group activities. Work effectively with teammates.	2
4.	**Player Stance & Footwork:** Improve movement and body balance. Apply proper stance during movement.	2

5.	**Passing Under Movement:** Practice passing while changing positions. Execute accurate passes while moving.	2
6.	**Dribbling Around Cones:** Improve control through obstacle drills. Maintain dribbling control in different directions.	2
7.	**Assessment- V**	2
8.	**Shooting Practice:** Practice shooting from different spots. Improve shooting accuracy.	2
9.	**Rebounding Drills:** Practice timing and ball recovery. Perform effective rebounding.	2
10.	**Individual Defense:** Practice defensive movement in simple drills. Apply defensive techniques effectively.	2
11.	**Body Technique:** Improve body positioning and balance. Demonstrate better body control.	2
12.	**Combined Fundamental Drills:** Integrate all basketball skills. Execute skills smoothly in sequence, Practice skills with a partner. Improve teamwork and communication	2
14.	**Assessment – VI**	2
	TOTAL	**26**

Text Books:

1. FIBA, "Official Basketball Rules", International Basketball Federation (FIBA)
2. Dr. James Naismith, "Basketball: Its Origin & Development",
3. John R. Wooden, "Practical Modern Basketball", Allyn & Bacon

Reference Books:

1. James Naismith – Basketball: Its Origin and Development – University of Nebraska Press.
2. Jerry V. Krause & Don Meyer – Basketball Skills & Drills – Human Kinetics

E-Resources:

1. Rules of Basketball : How to Play Basketball : Basketball Rules for Beginners
2. How To Dribble A Basketball For Beginners! Basketball Basics for Kids Basketball Training
3. How To Shoot A Basketball For Beginners! Basketball Basics [SECRETS]
4. Basketball: Rebounding

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** III		
Course: Liberal Learning – III (Cricket)							**Code:** 25ETCC305G		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop basic cricket skills. Fitness, teamwork, and knowledge of rules and strategies for effective game performance.

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

CO1	Analyze batting, bowling, fielding, and match strategies across T20, ODI, and Test cricket formats.
CO2	Apply tactical decision-making, leadership, field placements, and performance analysis during competitive matches.
CO3	Demonstrate effective cricket performance by integrating sports psychology, nutrition, injury prevention, and technology in match situations.

Course Contents:

Sr. No.	Description	Duration (Hrs.)
1.	**Batting Strategies:** Build innings in different formats	2
2.	**Bowling Plans:** Field settings and tactical bowling	2
3.	**Captaincy & Leadership:** Decision-making and leadership	2
4.	**Match Strategy:** Powerplay, middle overs, death overs	2
5.	**T20 Cricket Strategies:** Aggressive tactics	2
6.	**ODI Cricket Strategies / Test Cricket Strategies:** Rotation of strike and partnerships / Patience and long-form tactics	2
7.	**Assessment – V**	2
8.	**Advanced Field Placements:** Offensive and defensive setups	2
9.	**Sports Psychology:** Confidence and concentration	2
10.	**Nutrition for Cricketers:** Performance nutrition	2
11.	**Injury Prevention & Recovery:** Basic sports medicine	2
12.	**Technology in Cricket:** DRS, Hawk-Eye, performance analysis	2
14.	**Assessment – VI**	2
	TOTAL	**26**

Text Books:

1. Sanjay Manjrekar, "Cricket Fundamentals", Orient BlackSwan 2. Ravi Shastri, "Winning Cricket: Skills and Strategies", Notion Press 3. R. Sridhar, "Coaching Beyond", Rupa Publications India
Reference Books:
1. Rob Eastaway, "Cricket Explained: From Grubbers to Googlies", St. Martin's Griffin 2. Surendra Shrivastava, "Cricket – Khel Aur Niyam", Prabhat Prakashan
E-Resources:
1. Sports and Performance Nutrition, IIT Madras, https://onlinecourses.nptel.ac.in/noc24_hs82/ 2. How to Play Cricket 3. Cricket rules explained in 2 minutes 4. Every Cricket Shot Explained in 21 Minutes

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** III		
Course: Liberal Learning – III (Rifle and Pistol Shooting)							**Code:** 25ETCC305H		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop safe shooting skills, accuracy concentration, and proper shooting techniques in students. It also aims to build discipline, confidence and prepare shooters for competitive events.

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

CO1	Explain safe rifle handling, range discipline, equipment, and match procedures.
CO2	Demonstrate proper shooting techniques, physical coordination, and shooting posture.
CO3	Apply mental focus, concentration, and scientific principles to improve shooting performance.
CO4	Demonstrate sportsmanship, discipline, and overall proficiency in competitive shooting.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	**Recoil Management:** How to avoid recoil	2
2.	**Loading and Unloading Procedures: P**rocedure to load a gun.	2
3.	**Malfunction Identification and Clearance:** What is malfunction and its solutions	2
4.	**PGun Cleaning and Maintenance:** Process to open a gun and clean it	2
5.	**Ammunition Types and Selection:** Selecting a perfect ammunition from different ammunition companies	2
6.	**Environmental Effects on Shooting:** Effect on a shot of environment	2
7.	**Assessment – V**	2
8.	**Scoring Systems:** How to read score.	2
9.	**Competition Rules:** Explaining the rules and commands	2
10.	**Match Preparation:** Physical and mental preparation of a shooter for match	2
11.	**Mental Conditioning and Concentration:** Making a shooter mentally strong and increasing concentration process	2
12.	**Time-Controlled Shooting:** Procedure to fire a shot in given time	2
13.	**Assessment – VI**	2
	TOTAL	**26**

Text Books:

1. International Shooting Sport Federation (ISSF), "ISSF Official Statutes, Rules and Regulations",

International Shooting Sport Federation (ISSF) 2. National Rifle Association (NRA), "The NRA Guide to the Basics of Pistol Shooting", National Rifle Association of America 3. National Rifle Association (NRA), "The NRA Guide to the Basics of Rifle Shooting", National Rifle Association of America
Reference Books:
1. National Rifle Association (NRA), "The Fundamentals of Rifle Marksmanship", National Rifle Association of America 2. International Shooting Sport Federation (ISSF), "ISSF Official Statutes, Rules and Regulations", International Shooting Sport Federation (ISSF) 3. National Rifle Association (NRA), "The NRA Guide to the Basics of Pistol Shooting", National Rifle Association of America 4. National Rifle Association (NRA), "The NRA Guide to the Basics of Rifle Shooting", National Rifle Association of America
E-Resources:
1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406 2. Open Sight Air Rifle Shooting Sports For Beginners. @TheGunzoneNetwork - YouTube 3. Basics of the Standing Position | Sauer Academy 4. The Ideal Air Rifle Shooter with Abhinav Bindra [IND]

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** III		
Course: Liberal Learning – III (Volleyball)							**Code:** 25ETCC305I		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To equip participants with the essential skills and knowledge of volleyball, enabling them to perform fundamental techniques, understand basic rules, and participate in basic gameplay scenarios confidently.

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

CO1	Explain safe rifle handling, range discipline, equipment, and match procedures.
CO2	Demonstrate proper shooting techniques, physical coordination, and shooting posture.
CO3	Apply concentration, mental focus, and scientific principles to improve shooting performance.
CO4	Demonstrate discipline, sportsmanship, and overall proficiency in competitive shooting.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	**Double Blocking Technique:** Introduction to double blocking, stance and ready position, footwork for lateral movement, timing the jump with the attacker, hand positioning over the net, coordination between middle and wing blocker, drills on blocking angles and recovery.	2
2.	**Advance Digging:** Advanced defensive posture, digging against hard-driven spikes, rolling and diving techniques, pancake save, anticipation and reading the attacker, transition from defense to offense, reaction drills**.**	2
3.	**Advance Setting:** Jump setting, back setting, quick setting, setting accuracy under pressure, decision-making, communication with hitters, setter movement	2

	and transition drills.	
4.	**Cross Court And Line Spiking:** Approach mechanics, body positioning, wrist action, cross-court attack, line attack, shot placement, attacking against blockers, controlled hitting drills**.**	2
5.	**Advanced Blocking:** Single, double and triple blocking strategies, reading setter intentions, block coverage, penetration over the net, transition after blocking, tactical blocking drills.	2
6.	**Libero Skills:** Role and responsibilities of the libero, serve receive, defensive positioning, emergency setting, court communication, floor defense techniques, specialized libero drills.	2
7.	**Assessment – V**	2
8.	**Offensive Systems (5-1):** Introduction to the 5–1 offensive system, player rotations, setter responsibilities, transition from defense to offense, positional responsibilities, team coordination.	2
9.	**Offensive Combinations:** Quick attacks, tandem attack, slide attack, combination plays, synchronization between setter and attackers, offensive communication and execution drills.	2
10.	**Team Defensive System:** Perimeter defense, rotational defense, block-defense coordination, defensive coverage, court positioning, communication, transition to counterattack.	2
11.	**Tactical Serving:** Float serve and jump serve placement, serving strategies against different formations, targeting weak receivers, serving under pressure, tactical decision-making.	2
12.	**Competitive Match Practice:** Full competitive matches following official rules, tactical implementation, referee signals, teamwork, leadership, sportsmanship, and post-match performance evaluation.	2
13.	**Assessment – VI**	2
	TOTAL	**26**

Text Books:

1. Fédération Internationale de Volleyball (FIVB), "Official Volleyball Rules", FIVB Publications

2. Bonnie Kenny & Cindy Gregory, "Volleyball: Steps to Success", Human Kinetics 3. Anita Bean, "The Complete Guide to Sports Nutrition", Bloomsbury Sport 4. Ian Jeffreys, "The Warm-Up", Human Kinetics
Reference Books:
1. Pete Waite, "Aggressive Volleyball", Human Kinetics 2. Bob Bertucci, "Volleyball Drill Book", Human Kinetics
E-Resources:
1. Volleyball Rules : How to Play Volleyball : The Rules of Volleyball EXPLAINED! 2. 6 Basic Skills in Volleyball - YouTube 3. Everything You Need to Know About the Game of Volleyball - YouTube

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** III		
Course: Liberal Learning – III (Football)							**Code:** 25ETCC305J		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To enhance football players' technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.

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

CO1	Explain attacking, defensive, formation, and set-piece principles in football.
CO2	Apply possession, counter-attacking, and transition strategies in match situations.
CO3	Analyze performance using psychology, nutrition, injury management, and technology.
CO4	Demonstrate teamwork, decision-making, and tactical skills during matches.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	**Principles of Attack:** Understand and apply the principles of attack, including creating space, supporting teammates, progressing the ball, and creating goal-scoring opportunities.	2
2.	**Principles of Defense**: Understand and apply the principles of defense, including pressure, cover, balance, marking, and communication to effectively prevent opponents from scoring.	2
3.	**Team Formations:** Understand and apply different team formations to improve player positioning, tactical organization, and overall team performance.	2
4.	**Transition Play:** Understand and apply effective transition play by quickly	2

	switching between attacking and defensive phases to maintain team advantage.	
5.	**Possession-Based Football:** Develop possession-based football skills by improving ball retention, passing accuracy, movement, and decision-making to control the game effectively.	2
6.	**Counter-Attacking Football:** Understand and apply counter-attacking principles by transitioning quickly from defense to attack through speed, movement, and effective decision-making.	2
7.	**Assessment-V**	2
8.	**Set-Piece Organization**: Understand and apply set-piece organization by developing effective attacking and defensive strategies for free kicks, corners, and restarts.	2
9.	**Sports Psychology**: Develop mental skills such as confidence, focus, motivation, resilience, and decision-making to enhance football performance and overall sporting attitude.	2
10.	**Injury Management**: Understand basic injury management practices, including prevention, immediate care, recovery strategies, and safe return-to-play procedures for football players.	
11.	**Technology in Football:** Understand the role of technology in football by exploring tools for performance analysis, player development, match decisions, and injury prevention.	2
12.	**Full Match Analysis:** Analyze full match performance by evaluating tactics, player decisions, team organization, strengths, and areas for improvement.	2
13.	**Assessment-VI**	2
	TOTAL	**26**

Text Books:

1. Fédération Internationale de Football Association (FIFA), "Laws of the Game", FIFA
2. International Football Association Board (IFAB), "Laws of the Game", IFAB

Reference Books:

1. Charles Hughes, "The Winning Formula in Soccer", Meyer & Meyer Sport
2. Fédération Internationale de Football Association (FIFA), "Laws of the Game", FIFA

3. International Football Association Board (IFAB), "Laws of the Game", IFAB
E-Resources:
1. Udemy – Soccer Courses - https://www.udemy.com/topic/soccer/ 2. Beginner's guide to football | Football for dummies 3. Every position in soccer explained 4. Rules Of Soccer : How to play Soccer : Soccer Rules for Beginners

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** III
Course: Internship – I									**Code:** 25ETIN301
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
4 Weeks			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.

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SYLLABUS

SEMESTER - IV

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** IV	
Course: Communication Systems								**Code:** 25ETPC405	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

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 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, 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	06
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.	06
6.	**Baseband transmission & reception:** Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester Baseband Pulse Shaping, M-ray Signaling, ISI, eye diagram, scrambler, Unscramble	06
	TOTAL	**39**
	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", **IIT Kanpur**	

	https://nptel.ac.in/courses/108104091

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** IV	
Course: Communication Systems Lab								**Code:** 25ETPC405P	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	-	-	25	25

Prerequisites:

Electronic devices & circuits, signals & system.

Course Objectives:

1. To provide practical understanding of analog and digital communication systems through modulation, demodulation, sampling, and coding experiments.
2. To develop skills for analyzing the performance parameters of communication systems such as modulation index, bandwidth, aliasing, and signal-to-noise ratio.
3. To enable students to implement and simulate various communication techniques using hardware and MATLAB.

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

CO1	Implement and analyze amplitude and frequency modulation and demodulation systems.
CO2	Perform sampling, reconstruction, PAM, and PWM experiments and analyze the effect of sampling frequency and aliasing.
CO3	Implement and study pre-emphasis, de-emphasis, PCM, and companded PCM techniques.
CO4	Analyze and implement Delta Modulation (DM) and Adaptive Delta Modulation (ADM) systems.
CO5	Generate and analyze different line coding schemes and evaluate their spectral characteristics.
CO6	Simulate and evaluate communication systems using MATLAB, including sampling, modulation/demodulation, and performance analysis based on parameters such as SNR.

Course Contents:

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: NPTEL Course "Principles of Communication Systems-I", **IIT Kanpur** https://nptel.ac.in/courses/108104091

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** IV	
Course: Signals and Systems								**Code:** 25ETPC406	
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	07

	and time invariant systems, stable and unstable systems, invertible and non-invertible systems.	
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.	06
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, Inverse Laplace transform, Initial and final value theorem, analyzing input responses like step, impulse, or sinusoidal signals. Use of Laplace Transform in Ordinary and partial differential	06
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.	06
	TOTAL	**39**
	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 on Principles of Signals and Systems, IIT Kanpur https://nptel.ac.in/courses/108104100 2. Lecture Series on, "Signals & Systems", Video Lectures | Signals and Systems | Electrical Engineering and Computer Science | MIT OpenCourseWare

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** IV	
Course: Linear Integrated Circuits								**Code:** 25ETPC407	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
03	-	-	03	40	60	-	-	-	100

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. Clippers and Clampers, Peak Detector, Sample and Hold Circuit	06
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).	06
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.	06
	TOTAL	**39**
	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://nptel.ac.in/courses/108103378	

	b) NPTEL course on Analog Circuits – https://nptel.ac.in/courses/108105158 2. Virtual Lab on Analog Electronics Circuits, https://aec-iitkgp.vlabs.ac.in/

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** IV
Course: Linear Integrated Circuits Lab									**Code:** 25ETPC407P
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	-	-	25	25

Prerequisites:

Basic Electronics Engineering, Electronic Devices & Circuits

Course Objectives:

1. To develop practical understanding of operational amplifier characteristics and their applications in analog electronic circuits.
2. To provide hands-on experience in designing, constructing, and testing amplifier, filter, oscillator, and waveform generation circuits.
3. To develop skills in designing and analyzing linear and regulated power supply circuits using standard ICs.

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

CO1	Measure and analyze the important parameters and characteristics of operational amplifiers and compare them with standard specifications.
CO2	Design, construct, and test linear applications of operational amplifiers, including inverting, non-inverting, differential, summing, and subtractor circuits.
CO3	Implement and analyze op-amp-based integrator, differentiator, and instrumentation amplifier circuits.
CO4	Design and analyze active low-pass and high-pass filters and determine their frequency response.
CO5	Design and implement op-amp-based nonlinear and waveform generation circuits such as Schmitt trigger, oscillators, square-wave, and triangular-wave generators.
CO6	Design, construct, and test fixed and adjustable voltage regulator circuits using IC 78XX and LM317.

Course Contents:

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. 12. 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://nptel.ac.in/courses/108103378 b) NPTEL course on Analog Circuits – https://nptel.ac.in/courses/108105158 2. Virtual Lab on Analog Electronics Circuits, https://aec-iitkgp.vlabs.ac.in/ Virtual Lab on Analog Circuits, https://ae-iitr.vlabs.ac.in/

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)								**Semester:** IV	
Course: Course: Principles of AI and ML								**Code:** 25ETMD402	
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.

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.

   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 the foundation, history, types, and applications of AI and differentiate between AI, ML, and DL paradigms.
CO2	Analyze the structure and types of intelligent agents, evaluate the role of rationality, and assess ethical implications and global standards in AI.
CO3	Implement search strategies for AI problem-solving, including uninformed and informed search, and apply constraint satisfaction techniques like backtracking and local search.
CO4	Describe the structure and functioning of rule-based expert systems, apply inference techniques like forward and backward chaining, and design simple chatbot logic using Tiny ML concepts.
CO5	Define key ML concepts, evaluate hypothesis spaces, and apply supervised learning algorithms like linear/logistic regression, neural networks, and KNN.
CO6	Implement clustering algorithms such as K-means, DBSCAN, and hierarchical clustering, and apply dimensionality reduction techniques like PCA and unsupervised neural networks.

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:** Concept of Rationality, Nature of environment, Structure of agents, Types of AI Agent, Turing Test in AI. **Ethics in AI:** benefits and risks of AI, Introduction to Global Compliances for Ethical AI, Human vs Robots.	7
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	7

	in AI, **Constraint Satisfaction problem:** Structure of CSP Problem. Interference in CSPs; Back tracking search for CSPs, Local Search for CSPs, **Perception in AI:** Image formation, Early image processing operations, Object recognition by Appearance, Reconstructing the 3D World, Object Recognition from Structural Information.	
3.	**Expert System in AI:** Introduction to Expert Systems, Components of Expert Systems, Expert system development teams, Structure, Characteristics, Rule based expert system, K rules as knowledge representation, schemes, Forward chaining and backward chaining inference techniques, Conflict resolution in AI, Advantages and disadvantages, Applications of Expert Systems, Chat-Bots in NLP based expert systems, Simple logic bots, Basics of Tiny ML.	6
4.	**Introduction of Machine Learning:** Basics of Machine Learning, **Types of Learning:** Supervised, Unsupervised, Reinforcement learning, well posed learning problem, designing a simple learning system, issues in machine learning. Hypothesis Space, Hypothesis functions, Hypothesis Evaluation, Bias, Variance, Under fitting, Overfitting, Inductive bias, Training, Testing, Cross validation: Error Analysis, Error metrics: Accuracy, Precision, recall, and F1 Score.	7
5.	**Supervised Learning:** Preprocessing of data, Normalization and Scaling, Standardization, Various feature selection techniques (Wrapper, Filter and Embedded method), Sequential forward and backward selection. KNN (K Nearest Neighbor) algorithm, Linear Regression with Least Square Error Criterion, Logistic Regression for classification tasks, Neural network for supervised learning,	6
6.	**Unsupervised Learning:** Clustering Fundamentals, K-means clustering, Findings optimal number of clusters, Spectral Clustering, Hierarchical Clustering, DBSCAN clustering, Dimensionality Reduction using Principal Component Analysis (PCA), Neural network for unsupervised learning.	6
	Total	**39**
	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.	
	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. NPTL course on Artificial Intelligence https://nptel.ac.in/courses/106102220 2. NPTEL Course on Machine Learning https://nptel.ac.in/courses/106106139

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OPEN ELECTIVE - II

(Select any one course from the given Open Elective Courses)

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Common to all Programs)							**Semester:** IV		
Course: Open Elective – II (Cyber Security & Laws)							**Code:** 25ALOE402A		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	-	-	02	-	-	50	50	-	100

Prerequisites:

Foundational knowledge in computer science, networking.

Course Objectives:

1. To introduce the cyber world and cyber law in general.
2. To enhance the understanding of problems arising out of online transactions and provoke them to find solutions.
3. To know the technologies that stand behind certain cyber rimes.
4. To identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.

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

CO1	Illustrate and discuss the basic concepts of cyber security, Devices.
CO2	Understand the aspects related to personal data privacy and security.
CO3	Understand the main components of cyber security plan.
CO4	Understand about the type and nature of cyber-crimes.
CO5	Articulate the well-known cyber-attack incidents, explain the attack scenarios, and explain mitigation techniques.
CO6	Explain the difference between Systems Cyber Security, Network Cyber Security, and Cryptography, Crypto-Protocols, etc.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to Cyber Security:** Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security.	04
2.	**Digital Devices Security, Tools and Technologies for Cyber Security:** End Point device and Mobile phone security, Password policy, Security patch management, Data backup, Downloading and management of third-party software, Device security policy, Cyber Security best practices, Significance of host firewall, Wi-Fi security, Configuration of basic security	04

	policy and permissions.	
3.	**Cyber security Management, Compliance and Governance:** Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.	05
4.	**Cybercrimes:** Targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach Cybersquatting, Pharming, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft Cyber Police stations, Crime reporting procedure, Case studies	05
5.	**Cybercrime**: Illustrations, Examples and Mini cases, Real-life examples, Mini Cases- Social Engineering Attacks, Illustration of financial frauds in cyber domain, Digital Signature- Related Crime scenarios, Digital forensics case Illustrations, Online scams**.**	04
6.	**Cyber law:** Cybercrime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cybercrime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IOT, Block chain, Dark net and social media, Cyber Laws of other countries.	04
	TOTAL	**26**

Text Books:

1. Michael E. Whitman, Herbert J. Mattord, (2018), "Principles of Information Security", 6th edition, Cenage Learning, N. Delhi.
2. Chris Reed & John Angel, "Computer Law", OUP, New York, (2007).
3. Prasad R.S., "Cyber Crime an Introduction".
4. Ed. Kumar Krishna, "Cyber Laws".

Reference Books:

1. Angus M. Marshall, "Digital forensics: Digital evidence in criminal investigation", John – Wiley and Sons, 2008.
2. Sushma Arora, Raman Arora, "Cyber Crimes & Laws", 4th Edition 2021, Publisher: Taxmann,
3. N S Nappinai, "Technology Laws Decoded", 1st Edition, Publisher: Lexis Nexis.

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc23_cs127/preview
2. https://onlinecourses.swayam2.ac.in/nou19_cs08/preview
3. https://onlinecourses.nptel.ac.in/noc25_cs116/preview

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Common to all Programs)									**Semester:** IV
Course: Open Elective – II (Sustainability and Climate Change)									**Code:** 25ALOE402B
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	-	-	02	-	-	50	50	-	100

Prerequisites:

Students should have knowledge about current environmental issues, various types of pollution and the concept of sustainable development.

Course Objectives:

1. To introduce the fundamental concepts and definitions of sustainability
2. To equip students with knowledge of sustainable construction solutions.
3. To develop an understanding of the Earth's climate system, assess the impacts of climate change, and evaluate the vulnerabilities of natural systems.

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

CO1	Explain the principles, challenges, global agreements, and legislations related to sustainable development and environmental protection.
CO2	Apply green materials, energy-water efficiency strategies, and green building rating systems to develop sustainable infrastructure solutions.
CO3	Analyze the earth's climate system, human influences, and observed trends to understand the fundamentals of climate change.
CO4	Evaluate the causes, impacts, and physical evidence of climate change at global and regional scales.
CO5	Assess the sectoral impacts of climate change on natural systems, infrastructure, and human health.
CO6	Recommend mitigation strategies and policy measures through international frameworks and technological interventions to address climate change.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Sustainable Development:** Definitions & Dimensions: sustainability, Brundtland Report, triple bottom line (economic, social, environmental), Global & Local Environmental Challenges: resource depletion, climate change, pollution, Agenda 21, CDM, Paris/Kyoto Protocols, Clean Development Mechanism, Environmental Legislation & Standards: ISO 14000 series, Indian Water & Air Acts.	05

2.	**Sustainable Solutions:** Green Materials & Techniques: low-VOC paints, agro-waste bricks, bamboo, ferro-cement, stabilized soil blocks. Energy & Water Efficiency: passive design, renewable/solar/wind energy, rainwater harvesting, EIA in construction. Green Building Systems: LEED, GRIHA, ECBC, BREEAM rating frameworks for sustainable infrastructure.	05
3.	**Climate & Climate Change Fundamentals:** Earth's Climate System: Atmosphere structure, energy balance, greenhouse effect, climate zones, monsoons, El Niño/La Niña Human Influence: Greenhouse gas emissions, global warming trends, carbon cycle, RCP/SSP scenarios, Indian climate observations	04
4.	**Climate Change Impact:** Climate Change Impact: Temperature shifts, sea-level rise, extreme weather, glacier melt, urban heat islands, Natural vs. anthropogenic causes; Milankovitch cycles, anthropogenic emissions. Physical evidence: rising global temperatures, melting glaciers, sea-level rise, extreme weather trends in India and globally.	04
5.	**Impacts on Natural System:** Sectoral impacts: agriculture, water resources, infrastructure, coastal zones, urban systems including heat islands, flooding, human health	04
6.	**Mitigation & Policy Measures:** International policy processes: UNFCCC, IPCC, Kyoto/Montreal Protocols, CDM & carbon trading Technological and engineering mitigation: renewable energy, CCS, reflective surfaces (cool roofs), bioengineering (e.g., slope stabilization)	04
	TOTAL	**26**

Text Books:

1. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science", Pearson Education.
2. D. N. Murty, "Sustainable Development", Himalaya Publishing House.
3. Peter P. Rogers, Kazi F. Jalal, and John A. Boyd, "An Introduction to Sustainable Development", Routledge, Earthscan Series.
4. N. H. Ravindranath and Jayant Sathaye, "Climate Change and Developing Countries", Springer.

Reference Books:

1. K. S. Jagadish et al., "Alternative Building Materials & Technologies", New Age International Publishers.
2. P. T. Anastas and J. B. Zimmerman, "Principles of Green Engineering", Oxford University Press.

3. David T. Allen and David R. Shonnard, "Sustainability Engineering: Concepts, Design & Case Studies", Pearson Education.
4. S. Kumar Dash, "Climate Change – An Indian Perspective", Cambridge University Press, 2007.
5. John M. Wallace and Peter V. Hobbs, "Atmospheric Science: An Introductory Survey", Elsevier Academic Press, 2006.
6. IPCC Assessments, Intergovernmental Panel on Climate Change (IPCC), as referenced in Anna University syllabus.

E-Resources:

1. UNEP (United Nations Environment Programme)
   https://www.unep.org/resources
2. IPCC (Intergovernmental Panel on Climate Change) Reports
   https://www.ipcc.ch/reports/
3. edX - Sustainability Courses
   https://www.edx.org/learn/sustainability
4. Coursera - Climate Change Courses
   https://www.coursera.org/courses?query=climate%20change
5. NASA Global Climate Change: Vital Signs of the Planet
   https://climate.nasa.gov/
6. World Bank Open Knowledge Repository
   https://openknowledge.worldbank.org/
7. UC Berkeley Environmental Courses (Search for PDFs)
   https://nature.berkeley.edu/classes/
8. MIT Open Courseware - Environmental Topics
   https://ocw.mit.edu/courses/find-by-topic/#cat=environment

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Common to all Programs)							**Semester:** IV		
Course: Open Elective – II (Energy Audit and Electrical Safety)							**Code:** 25ALOE402C		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**PR**	**OR**	**Total**
02	-	-	02	-	-	50	50	-	100

Prerequisites:

Concept of power & energy in three phase & single phase, Various electrical equipment & specifications

Course Objectives:

1. To Study the importance of energy security for sustainable development and the fundamentals of energy conservation.
2. To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management
3. To relate the data collected during performance evaluation of systems for identification of energy saving opportunities
4. Understand the key terms and definitions related to electrical safety.
5. Learn about preliminary preparations and preconditions necessary before starting installation work.

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

CO1	Illustrate present state of energy security and its importance.
CO2	Identify and describe the basic principles and methodologies adopted in energy audit of utility.
CO3	Illustrate and analyze the Financial Analysis Techniques.
CO4	Evaluating the performance of some common thermal installations and list the energy saving opportunities.
CO5	Demonstrate awareness of the scope and significance of electrical safety in reducing risk and ensuring safe practices in electrical systems.
CO6	Identify and a**ssess** the potential risks and hazards associated with the installation process of electrical equipment.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Energy Scenario:** Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, Energy Conservation Act-2001 and its features, Re-structuring of the energy supply	05

	sector, energy strategy for the future, air pollution, climate change, Electricity Act, 2003.	
2.	**Energy Management & Audit:** Definition, need and types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments, Facility as an energy system, Energy analysis and the Sankey Diagram, Organizing - location of energy management, top management support, managerial function, roles and responsibilities of energy manager, force field analysis, Energy policies and its purpose.	05
3.	**Financial Management:** Investment-need, appraisal and criteria, financial analysis techniques-simple payback period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of ESCOs, Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques -energy consumption, production, cumulative sum of difference (CUSUM).	04
4.	**Energy Efficiency in Electrical Utilities:** Electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors, energy conservation opportunities in Fans, Blower, Pumps, Lighting System.	04
5.	**Introduction to Electrical Safety, Shocks And Their Prevention:** Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, principles of electrical safety, Primary and secondary electrical shocks, causes of electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns in residential buildings and shops.	04
6.	**Safety During Installation of Plant and Equipment:** Introduction, preliminary preparations, preconditions for start of installation work, risks during installation of electrical plant and equipment, safety aspects during installation, field quality and safety during erection, personal protective equipment for erection personnel, installation of a large oil immersed power transformer, installation of outdoor switchyard equipment, safety during installation of electrical rotating machines.	04
	TOTAL	**26**

Text Books:

1. Energy Audit and Management, Volume-I, IECC Press.
2. W.R. Murphy, G. McKay Butter worth," Energy management", Elsevier/bsp Books Pvt. Ltd., 2003.
3. Gupta B. R.: Generation of Electrical Energy, Eurasia Publishing House Pvt. Ltd., New Delhi, 2001
4. Prasanna Chandra, "Financial management", Tata McGraw Hill, 10th Edition, 2019.
5. Rao, S. and Saluja, H.L., "Electrical Safety, Fire Safety Engineering and Safety Management", Khanna Publishers, 1988.
6. Pradeep Chaturvedi, "Energy Management Policy, Planning & Utilization", Concept Publishing.

Reference Books:

1. Albert Thumann, P.E., C.E.M. William J. Younger, "Handbook of Energy Audits", River Publishers,
2. Paul O'Callaghan, "Energy management", McGraw-Hill Education, 1992.
3. CB Smith, "Energy Management Principles", Pergamon Press, New York.
4. W. C. Turner, "Energy Management Hand Book". John Wiley and sons.

E-Resources:

1. NPTEL course on Basic Principles of Energy Management & Energy Audit, By Dr. R. N. Patel & Dr. Akhilesh Kumar Tiwari, Chhattisgarh Swami Vivekanand Technical University, Bhilai.
   Basic Principles of Energy Management & Energy Audit - Course
2. NPTEL course on Building Energy Systems and Auditing, By Prof. Shankha Pratim Bhattacharya, IIT Kharagpur.
   Building Energy Systems and Auditing - Course

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Common to all Programs)							**Semester:** IV		
Course: Open Elective – II (Digital Marketing)							**Code:** 25ALOE402D		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	-	-	02	-	-	50	50	-	100

Prerequisites:

Fundamentals of Business, Digital Tools

Course Objectives:

1. To understand digital marketing & process of website design.
2. To identify the keywords for a website & understand the SEO.
3. To Study the various Digital Marketing Tools.
4. To learn the use of social media websites for Digital Marketing.
5. To be Conversant with Linked In platform.
6. To know the recent trends in Digital Marketing.

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

CO1	Design websites using free tools like wordpress and explore it for digital marketing.
CO2	Apply various keywords for a website & to perform SEO.
CO3	Understand the various SEM Tools and implement the Digital Marketing Tools.
CO4	Illustrate the use of Facebook, Instagram and YouTube for Digital Marketing in real life.
CO5	Use Linked in platform for various campaigning.
CO6	Understand the importance of recent trends in digital marketing.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Digital Marketing Planning and Structure:** Importance of Digital Marketing, Digital Marketing Vs. Traditional Marketing, Inbound vs Outbound Marketing, Understanding Demographics. WWW, Buying a Domain, Core Objective of Website and Flow, One Page Website, Strategic Design of Products & Services Page, Strategic Design of Landing Page, Segmentation & Targeting and Positioning to Digital Marketing, Portfolio, Gallery and Contact Designing Wordpress Website.	04
2.	**Search Engine Optimization (SEO):** Fundamentals; Keywords and SEO Content Plan; SEO & Business Objectives; Writing SEO Content; On-site & off-site SEO; Optimize Organic	04

	Search Ranking, Website SEO Auditing. Introduction to Web Analytics	
3.	**Search Engine Marketing:** Importance of Adwords, Google Ad Types, PPC Cost Formula, Ad Page Rank, Billing and Payments, Adwords User Interface, Keyword Planner, Creating Ad Campaigns, Creating Text Ads, Creating Ad Groups, Search Engine Marketing (SEM) Tools, Bidding Strategy for CPC. Case Studies. Conversion Tracking Code, Designing Image Ads, Creating Video Ads, Youtube Video Promotion	05
4.	**Social Media Marketing (SMM) Part 1:** **B to C Perspective, B to B Perspective:** Introduction; Major Social Media Platforms for Marketing; Developing Data-driven Audience & Campaign Insights; Social Media for Business. **Facebook & Instagram Marketing:** Understanding of Facebook Marketing, Types of Facebook Advertising, Creating first ad on Facebook, Setting Campaign and optimization, Facebook Power Editor, Facebook Video Marketing, Facebook App & Shopping Marketing. **Youtube Marketing:** YouTube Account Setup (Create a business account with a personal account), YouTube Monetization, YouTube Ads, YouTube Analytics.	05
5.	**Social Media Marketing (SMM) Part 2:** **LinkedIn Advertising:** How to use Linkedin Professionally, Types of LinkedIn Advertising, LinkedIn New feed Advertising, LinkedIn Message Pitching, Traffic and Leads Generation, Billing and Report. **Email Marketing:** Email Software and Tools, Importing Email Lists, Planning Email Campaign, Email Templates and Designs, Sending HTML Email Campaigns, Web Forms Lead Importing, Integrating Landing Page Forms, Campaign Reports and Insights, Segmentation Strategy, Responder Tracker.	04
6.	**Upcoming Trends in Digital Marketing:** Podcast, OTT Platforms, Mob-Ad, No Click Searches, Google Verified Listing, Voice Search, Visual Search, Online Reviews, Automated and Smart Bidding, Chatbots, Affiliate Marketing.	04
	TOTAL	**26**

Text Books :

1. Cory Rabazinsky, "Google-Ad words for Beginners: A Do-It-Yourself Guide to PPC Advertising".
2. Ian Brodie, "Email Persuasion: Captivate and Engage Your Audience, Build Authority and Generate More Sales With Email Marketing".

3. Jan Zimmerman and Deborah, "Social Media Marketing All-In-One for Dummies".
4. Dave Chaffey, Fiona Ellis-Chadwick, Kevin Johnston, Richard Mayer, "Internet Marketing", Pearson Education.
5. Oliver J Rich, "Digital Marketing".
6. Gerry T. Warner and Joe Wilson Schaefer "Online Marketing".

Reference Books:

1. Prof. Seema Gupta, "Digital Marketing", Mcgraw Hill Publications.
2. Judy Strauss, Adel Ansary, Raymond Frost, Prentice Hall, "E- Marketing".
3. Dr. Andy Williams,"WordPress for Beginners 2020: A Visual Step-by-Step Guide to Mastering WordPress".
4. Cecilia Figueroa, "Introduction To Digital Marketing 101", BPB Publications.
5. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns by Ian Dodson, Wiley; 1st edition (2016).
6. Digital Marketing For Dummies by Ryan Deiss and Russ Henneberry, For Dummies

E-Resources:

1. Digital Tools Certification- By Google.
   Link of the Course: https://skillshop.exceedlms.com/student/catalog
2. Swayam Certification course on, "Digital Marketing", by Dr. Tejindarpal Singh Panjab University Chandigarh.
   Link of the Course: https://swayam.gov.in/nd2_ugc19_hs26/preview

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Robotics & Automation Engineering)							**Semester:** IV		
Course: Open Elective – II (Entrepreneurship and Innovations)							**Code:** 25ALOE402E		
Teaching Scheme				**Evaluation Scheme**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
02	-	-	02	-	-	50	50	-	100

Prerequisites:

Professional Development, Quality Management System

Course Objectives:

1. To learn the students various aspects of innovation and methods of fostering Innovation
2. To appreciate the importance of embarking on self-employment and has developed the confidence and personal skills for the same.
3. To start a small business enterprise by liaising with different stake holders.
4. To effectively manage small business enterprise.

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

CO1	Understand the key concepts of innovation
CO2	Identify and analyze opportunities for innovation
CO3	Recognize the potential and value of self-employment
CO4	Develop a viable business plan for a small enterprise
CO5	Apply financial principles to plan and structure engineering and automation projects effectively
CO6	Apply fundamental principles of management

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to Innovation:** Creativity, Invention and innovation, Types of Innovation, Relevance of Technology for Innovation, The Indian innovations and opportunities, Promoting and managing innovation, Innovators and Imitators, Patents, Trademarks, Intellectual Property, Exploring, Executing, Leveraging and renewing innovation, Enhancing Innovation Potential & Formulating strategies for Innovation	04
2.	**Strategy for Commercializing Innovation:** Innovation Process, Risks and barriers for introducing products and services, selecting a Strategy, setting up the Investment and establishing organisation, Evaluating the Costs and impact of the Project	04
3.	**Entrepreneurship:** Definition. Growth of industries in developing countries; role of industries in the national economy; characteristics; demand based and resources based ancillaries	04

	and sub-control types. Government policies, stages in starting an industry, types (family business/start-ups etc.), Sources of finance	
4.	**Project Identification and Accountancy:** Assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, Accountancy: Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, preparation of financial reports, accounts and stores studies.	04
5.	**Project Planning and Control:** The financial functions cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. Profit planning and programming, planning cash flow, capital expenditure and operations. Control of financial flows, control and communication.	05
6	**Laws:** Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.	05
	TOTAL	**26**

Text Books:

1. Rabindra N. Kanungo, "Entrepreneurship and Innovation", Sage Publications, New Delhi, 1998.
2. Donald F. Kuratko, "Entrepreneurship – Theory, Process and Practice", 9th Edition, Cengage Learning, 2014.
3. Peter F. Drucker, "Innovation and Entrepreneurship", Butterworth-Heinemann.

Reference Books:

1. Robin Lowe and Sue Marriott, "Enterprise: Entrepreneurship and Innovation – Concepts, Contexts and Commercialization", Butterworth-Heinemann.
2. S. S. Khanka, "Entrepreneurial Development", S. Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.
3. Joseph L. Massie, "Essentials of Management", Prentice Hall of India.

E-Resources:

1. https://ocw.mit.edu/collections/entrepreneurship/
2. https://onlinecourses.nptel.ac.in/

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** VI
Course: Project Management System – I									**Code:** 25ETMC302
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

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)									Semester: IV
Course: Problem Solving Techniques – II									Code: 25ETAE402
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

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** IV
Course: Object oriented Programing Lab									**Code:** 25ETVS404
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
1	02	-	02	-	-	25	25	-	50

Prerequisites:

Make the students familiar with basic concepts and techniques of object oriented programming in C++ To acquaint the students with the fundamental principles of modulation process and different amplitude and angle modulation systems. • Develop an ability to write programs in C++ for problem solving.

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	Describe the principles of object oriented programming
CO2	Apply the concepts of data encapsulation, inheritance in C++.
CO3	Understand Operator overloading and friend functions in C++.
CO4	Apply the concepts of classes, methods inheritance and polymorphism to write programs C++.
CO5	Apply Templates, Namespaces and Exception Handling concepts to write programs in C++.
CO6	Describe and use of File handling in C++.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	**Introduction to Object-Oriented Programming:** Programming paradigms: Procedural, Modular and Object-Oriented Programming; Need for OOP; Basic concepts of OOP – Objects, Classes, Data Members, Member Functions, Encapsulation, Abstraction, Inheritance and Polymorphism; Structure of a C++ program; Variables, Data Types, Scope Resolution Operator; Inline Functions and Function Overloading.	2
2.	**Functions and Classes:** Call by Value, Call by Reference, Default Arguments, Return by Reference, this Pointer; Dynamic Memory Allocation (new and delete); Defining Classes and Objects; Access Specifiers; Member Functions; Static Data Members and Static Member Functions; Constructors and Destructors (Default, Parameterized and Copy Constructors).	3

3.	**Operator Overloading:** Fundamentals of Operator Overloading; Rules and Restrictions; Unary and Binary Operator Overloading; Member Functions versus Friend Functions; Introduction to Friend Functions.	2
4.	**Inheritance and Polymorphism:** Base and Derived Classes; Types of Inheritance; Multiple Inheritance; Virtual Base Class; Function Overriding; Virtual Functions; Pure Virtual Functions; Abstract Classes; Early and Late Binding.	3
5.	**Templates and Exception Handling**: Function Templates and Class Templates; Introduction to Namespaces; Exception Handling using try, throw, and catch; Multiple Exceptions and Exception Handling with Arguments.	2
6.	**C++ Streams and File Handling:** C++ Stream Classes; Console Input/Output; Formatted and Unformatted I/O; File Streams (ifstream, ofstream, fstream); Reading and Writing Files; Revision and Simple Object-Oriented Applications.	2
	TOTAL	**14**
	List of Experiments:	
	1. Write, compile and execute a simple C++ program demonstrating the structure of a C++ program, input/output, variables, and data types. 2. Develop C++ programs using inline functions, function overloading, and scope resolution operator. **3.** Implement programs demonstrating call by value, call by reference, default arguments, and return by reference. **4.** Write programs using dynamic memory allocation (new and delete) and the this pointer. 5. Develop programs to define classes and objects, implement member functions, and demonstrate different access specifiers. 6. Implement programs using constructors (default, parameterized, and copy constructors) and destructors. 7. Write programs demonstrating static data members and static member functions. 8. Develop programs to overload unary operators using member functions. 9. Implement binary operator overloading using member functions and friend functions. 10. Write programs demonstrating single, multilevel, and hierarchical inheritance. 11. Develop programs using multiple inheritance, virtual base classes, and function overriding. 12. Implement runtime polymorphism using virtual functions and abstract base classes. 13. Write programs using function templates and class templates for generic programming. 14. Develop programs demonstrating namespaces and exception handling using try, throw, and catch blocks. 15. Write a C++ program to perform file operations (read, write, append) using file streams (ifstream, ofstream, fstream) for a simple object-oriented application such as student record or employee management. Minimum 10 experiments from above list	
	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:
	1. NPTEL Course "Programming in C++" https://nptel.ac.in/courses/106/105/106105151

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Liberal Learning - IV

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** IV		
Course: Liberal Learning – IV (Guitar)							**Code:** 25ETCC406A		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music and Guitar musical instrument.

Course Objectives:

1. To develop advanced technical proficiency, musical interpretation, and performance skills through complex repertoire.
2. To enhance creativity, improvisation, composition, and theoretical understanding across multiple musical genres.
3. To strengthen ensemble leadership, stage performance, and professional musicianship for advanced musical pursuits.

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

CO1	Perform advanced guitar repertoire with technical accuracy, musical expression, and stylistic interpretation.
CO2	Apply advanced harmony, rhythm, improvisation, composition, and performance techniques across different musical genres.
CO3	Demonstrate ensemble leadership, collaboration, stage etiquette, and professional musicianship.

Course Contents:

Sr. No.	Description	Duration (Hrs.)
1.	Revision of Semester III Concepts	2
2.	Advanced Chord Voicings & Inversions	2
3.	Modal Scales & Advanced Scale Applications	2
4.	Improvisation over Chord Progressions	2

5.	Advanced Fingerstyle & Hybrid Picking	2
6.	Guitar Solo Techniques – Bends, Vibrato, Legato	2
7.	Song Arrangement & Musical Interpretation	2
8.	Introduction to Composition & Melody Writing	2
9.	Ensemble Rehearsal & Musical Communication	2
10.	Genre-based Performance (Jazz, Rock, Blues, Contemporary)	2
11.	Stage Performance Techniques & Performance Psychology	2
12.	Mock Recital & Individual Feedback	2
13.	Final Rehearsal & Performance Preparation	2
	TOTAL	**26**

Text Books:

1. Hal Leonard Corporation, "Hal Leonard Guitar Method – Complete Edition", Hal Leonard Publications.
2. Mel Bay, "Modern Guitar Method – Grade 1, 2 & 3", Mel Bay Publications.
3. Leavitt, W., "A Modern Method for Guitar (Books 1–3)", Berklee Press.
4. Stetina, T., "Fretboard Mastery", Hal Leonard Publications.
5. Kolb, T., "Music Theory for Guitarists", Hal Leonard Publications.

Reference Books:

1. Chapman, R., "The Complete Guitar Manual", DK Publishing.
2. Latarski, D., "Practical Theory for Guitar", Alfred Music.
3. Denyer, R., "The Guitar Handbook", Knopf Publishing.
4. Buckingham, B., "Scales and Modes for Guitar", Hal Leonard Publications.

E-Resources:

1. Berklee Online – Guitar lessons, music theory, ear training, and performance resources. https://online.berklee.edu
2. JustinGuitar – Structured guitar lessons from beginner to advanced. https://www.justinguitar.com
3. Fender Play – Interactive lessons on chords, scales, techniques, and songs. https://www.fender.com/play
4. TrueFire – Professional online guitar courses covering multiple genres and techniques.

https://truefire.com

5. Ultimate Guitar – Tabs, chord charts, scales, and community resources.
   https://www.ultimate-guitar.com
6. MuseScore – Free music notation software and sheet music library.
   https://musescore.org
7. MusicTheory.net – Interactive music theory lessons and exercises.
   https://www.musictheory.net
8. Yamaha Music India – Educational resources on guitar fundamentals and musicianship.
   https://in.yamaha.com

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** IV		
Course: Liberal Learning – IV (Singing)							**Code:** 25ETCC406B		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music in singing.

Course Objectives:

1. To develop voice modulation, singing, and expression techniques across different musical genres.
2. To familiarize students with microphone handling, studio setup, microphone placement, and recording practices.
3. To enhance students' recording and stage performance skills through practical application of raga, tala, rasa, and presentation techniques.

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

CO1	Apply voice modulation, pitch control, and singing techniques in various styles.
CO2	Perform Khayal, Semi-Classical, and Folk compositions with musical expression.
CO3	Demonstrate microphone handling, recording skills, and stage presentation.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Voice range development and voice modulation, Pitch control and tonal accuracy	4
2.	Voice culture for studio singing	4
3.	Singing techniques in different genres: Light Music, Film Songs, Ghazals, Lavani etc., Expression according to song style	4
4.	Vilambit Khayal, Drut Khayal	4
5.	Semi-Classical Music, Folk Music	2

6.	Performance practice, Stage presentation skills	2
7.	Knowledge of Raga and Tala, Rasa and Musical Expression	2
8.	Studio setup, Microphone handling techniques, Microphone placement, Recording techniques, Recording practice	4
	TOTAL	**26**

Text Books:

1. **Bhatkhande, V. N., "Kramik Pustak Malika (Vol. III & IV)", Hindustani Music Publications.**
2. **Paluskar, V. D., "Sangeet Bal Prakash", Gandharva Mahavidyalaya Mandal.**

Reference Books:

1. Bhatkhande, V. N., "Hindustani Sangeet Paddhati (Vol. I–IV)", Sangeet Karyalaya.
2. Ranade, A. D., "Hindustani Music: Tradition in Transition", Promilla & Co. Publishers.
3. Ratanjankar, S. N., "Abhinav Geet Manjari", Sangeet Karyalaya.

E-Resources:

1. Sangeet Natak Akademi
2. All India Radio (Akashvani)
3. SwarGanga Music Foundation
4. YouTube – Sangeet Natak Akademi Channel
5. Digital Tanpura and Tabla Applications (e.g., iTanpura, Riyaz, NaadSadhana)

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** IV		
Course: Liberal Learning – IV (Cinematography)							**Code:** 25ETCC406C		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

A basic understanding of film theory, Camera operation, Lighting techniques and visual storytelling is essential for cinematography.

Course Objectives:

1. To develop proficiency in camera operation, exposure settings, and photographic composition.
2. To apply lighting techniques and visual storytelling principles across different photography genres.
3. To develop basic image editing and post-processing skills using appropriate software.
4. To enhance creative, technical, and professional skills for effective photography practice.

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

CO1	Operate cameras confidently and use various camera settings effectively.
CO2	Apply exposure principles by controlling aperture, shutter speed, and ISO to capture quality images.
CO3	Compose visually appealing photographs using principles of composition and design.
CO4	Utilize natural and artificial lighting techniques to enhance photographic results.
CO5	Capture photographs in different genres such as portrait, landscape, product, event, and wildlife photography.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	Revision Session Of Sem III	2
2.	Storyboarding and planning	2

3.	Short film Screening	2
4.	Short Film Project (Camera-Phone)	2
5.	Short Film Project	2
6.	Short Film Project	2
7.	Short Film Project	2
8.	Short Film Project	2
9.	Short Film Project	2
10.	Short Film Project Submission	2
11.	Introduction Video Editing	2
12.	Basic Knowledge of Editing Tools	2
13.	Basics Timeline, Color Correction, Transition, Effects	2
	TOTAL	**26**

Text Books:

1. Peterson, B., "Understanding Exposure – Theory + Fundamentals", Amphoto Books.
2. Kelby, S., "The Digital Photography Book – Practical + Shooting", Rocky Nook.

Reference Books:

1. Langford, M., "Langford's Basic Photography – Technical Concepts", Focal Press.
2. Freeman, M., "The Photographer's Eye – Composition, Visual Balance, Framing, Perspective", Ilex Press.

E-Resources:

1. https://youtu.be/V7z7BAZdt2M?si=to4yQ46zEKRbxKOm
2. https://youtu.be/WXdAX0No2hM?si=GZu_mJsmyJ7NGnAU

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** IV		
Course: Liberal Learning – IV (Dance)							**Code:** 25ETCC406D		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Good stamina, flexibility and familiarity with simple rhythmic patterns and beats.

Course Objectives:

1. To develop advanced dance techniques with precision, coordination, balance, flexibility, and rhythmic control.
2. To enhance expressive skills, musicality, stage presence, and overall performance quality.
3. To develop creativity and choreography skills through individual and group dance compositions.
4. To integrate technique, rhythm, expression, synchronization, and stagecraft in complete performances.
5. To develop leadership, teamwork, discipline, confidence, and professional performance skills through rehearsals, competitions, and cultural events.

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

CO1	Demonstrate advanced dance techniques with precision, coordination, flexibility, balance, and rhythmic control.
CO2	Apply musicality, expression, synchronization, creativity, and stage presence in individual and group performances.
CO3	Create and present dance compositions using advanced choreography, formations, transitions, and stagecraft.
CO4	Plan, rehearse, and perform polished dance presentations for cultural events, competitions, and advanced training.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**

1.	Revision of prior semester & Warm-up	2
2.	Introduction formatted story telling through dance	2
3.	Learning the First Half of the Composition ,	2
4.	Completion of Composition with Rhythm and introduction to live music dancing format	2
5.	Theme-Based Choreography – Planning and Concept Development	2
6.	Production introduction and choreography completion	2
7.	Lights and stage formative knowledge	2
	TOTAL	**26**

Text Books:

1. Bharata Muni, "Natya Shastra", translated by Manomohan Ghosh, Asiatic Society, Kolkata.
2. Nandikeshvara, "Abhinaya Darpana", translated by Manomohan Ghosh.
3. Balasaraswati, T., "Dance", Madras Music Academy.
4. Krishna Iyer, E., "Dance", Ganesh & Co., Chennai.

Reference Books:

1. Kothari, Sunil, "Dance", Marg Publications, Mumbai.
2. Vatsyayan, Kapila, "Dance: Indian Dance in Literature and the Arts", Sangeet Natak Akademi.
3. Payne, Helen, "Creative Dance and Movement in Groupwork", Routledge, 2021.

E-Resources:

1. https://youtu.be/VTrGVHvWfPA?si=AvKTenB7bpx302R6
2. https://youtu.be/pG0NmQDKspc?si=AEfhbRAEs9OjNErp
3. https://youtu.be/eg-3ybiL6UI?si=AOj0NuGXDupxD2Mt

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)								**Semester:** IV	
Course: Liberal Learning – IV (Synthesizer/Keyboard)								**Code:** 25ETCC406E	
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Basic knowledge of Indian classical music and Keyboard musical instrument.

Course Objectives:

1. To strengthen understanding of fundamental keyboard concepts and techniques.
2. To develop proficiency in major and minor scales and arpeggios through practical exercises.
3. To enhance accompaniment, improvisation, and jamming skills through practical performance.
4. To develop listening skills, musical creativity, and ensemble performance techniques.

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

CO1	Demonstrate improved technical proficiency through advanced practice of Major and Minor Scales.
CO2	Perform musical pieces based on Minor Scales with proper fingering, expression and dynamics.
CO3	Apply arpeggio patterns effectively in chord progressions and keyboard performance.
CO4	Demonstrate accompaniment, improvisation and jamming skills in solo and group performances.
CO5	Develop listening ability, rhythmic accuracy and musical confidence through ear training and ensemble practice.

Course Contents:

Unit	**Description**	**Duration (Hrs.)**
1.	Revision of all Major Scales	2
2.	Revision of all Minor Scales (Natural, Harmonic & Melodic)	2

3.	Revision of Major and Minor Chords,	2
4.	Revision of Chord Progression, Family chords, Chords Inversion	2
5.	Playing Simple Songs with Indian Notation	2
6.	Introduction to Staff Notation	2
7.	Understanding the Difference between Indian and Western Staff	2
8.	Reading and Playing Simple Melodies from Staff Notation	2
9.	Playing Songs using Both Indian and Staff Notation	2
10.	Fundamentals of Keyboard Accompaniment	2
11.	Accompaniment using Major and Minor Chords	2
12.	Accompaniment with Scales and Simple Songs	2
13.	Group Performance	2
	TOTAL	**26**

Text Books:

1. Aaron, M., "Michael Aaron Piano Course – Grade 2", Alfred Music.
2. Thompson, J., "John Thompson's Modern Course for the Piano – Second Grade", Willis Music.
3. Hanon, C. L., "The Virtuoso Pianist in Sixty Exercises", G. Schirmer.
4. Agay, D., "Learning to Play Piano – Book 2", Yorktown Press.

Reference Books:

1. Thompson, J., "Modern Course for the Piano", Willis Music.
2. Aaron, M., "Piano Course", Alfred Music.
3. Harrison, M., "Contemporary Music Theory", Hal Leonard.
4. Hanon, C. L., "The Virtuoso Pianist", G. Schirmer.
5. ABRSM, "Music Theory in Practice (Grades 1–5)", Associated Board of the Royal Schools of Music.

E-Resources:

1. https://youtu.be/2mPS-2guHVo?si=8X_4KKezIdrMejLH
2. https://youtu.be/tEtukfFv3Wk?si=2iJ8wdD0dfjWauPb

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** IV		
Course: Liberal Learning – IV (Basketball)							**Code:** 25ETCC406F		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop fundamental basketball skills, physical fitness, teamwork, and understanding of rules and strategies to enable effective participation and performance in the game.

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

CO1	Demonstrate fundamental basketball skills including passing, dribbling, shooting, and rebounding.
CO2	Apply proper footwork, body control, and individual defensive techniques during play.
CO3	Integrate fundamental skills effectively through drills, small-sided games, and practice matches.
CO4	Demonstrate teamwork, coordination, confidence, and consistency in basketball performance.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	**Complete Skill Revision:** Review all basketball fundamentals. Recall and perform all basic skills.	2
2.	**Passing & Receiving Practice:** Improve passing speed and accuracy. Demonstrate efficient passing skills.	2
3.	**Dribbling:** Enhance control and confidence. Maintain effective dribbling during movement.	2
4.	**Shooting:** Continue improving shooting technique. Achieve better shooting consistency.	2

5.	**Rebounding:** Reinforce rebounding fundamentals. Secure rebounds confidently.	2
6.	**Individual Defense:** Improve defensive positioning. Apply correct defensive techniques.	2
7.	**Assessment – VII**	2
8.	**Body Technique and Footwork:** Reinforce movement and balance. Demonstrate efficient basketball footwork.	2
9.	**Skill Integration:** Combine all fundamental skills. Execute basketball movements smoothly.	2
10.	**Partner Skill:** Develop teamwork through drills. Improve coordination with teammates.	2
11.	**Small Sided Games:** Apply skills in simple match situations. Use basketball fundamentals during gameplay.	2
12.	**Practice Match:** Reinforce practical learning. Participate confidently in basketball games.	2
13.	**Assessment - VIII**	2
	TOTAL	**26**

Text Books:

1. FIBA, "Official Basketball Rules", International Basketball Federation (FIBA)
2. Dr. James Naismith, "Basketball: Its Origin & Development"
3. John R. Wooden, "Practical Modern Basketball", Allyn & Bacon

Reference Books:

1. James Naismith – Basketball: Its Origin and Development – University of Nebraska Press.
2. Jerry V. Krause & Don Meyer – Basketball Skills & Drills – Human Kinetics

E-Resources:

1. Rules of Basketball : How to Play Basketball : Basketball Rules for Beginners
2. How To Dribble A Basketball For Beginners! Basketball Basics for Kids Basketball Training
3. How To Shoot A Basketball For Beginners! Basketball Basics [SECRETS]
4. Basketball: Rebounding

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** II		
Course: Liberal Learning – IV (Cricket)							**Code:** 25ETCC406G		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop basic cricket skills. Fitness, teamwork, and knowledge of rules and strategies for effective game performance.

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

CO1	Demonstrate basic batting, bowling, and fielding skills with consistency.
CO2	Apply learned cricket skills, coordination, and decision-making during match situations.
CO3	Demonstrate basic umpiring knowledge, fair play, teamwork, and sportsmanship.
CO4	Demonstrate overall cricket proficiency through practice and competitive matches.

Course Contents:

Sr. No.	Description	Duration (Hrs.)
1.	**Revision of Batting Skills:** Strengthen all basic batting techniques.	2
2.	**Revision of Bowling:** Improve consistency and control in bowling.	2
3.	**Revision of Fielding Skills:** Enhance catching, throwing, and ground fielding.	2
4.	**Combined Skill Practice:** Practice batting, bowling, and fielding together.	2
5.	**Net Practice:** Improve performance through focused practice.	2
6.	**Team Coordination:** Develop communication during play.	2
7.	**Assessment - VII**	2
8.	**Match Awareness Practice Match I:** Understand basic match situations / Apply all learned skills in a game.	2
9.	**Practice Match II:** Improve decision-making during play.	2
10.	**Practice Match III:** Build confidence through match experience.	2
11.	**Basic Umpiring:** Learn simple umpiring signals and decisions.	2
12.	**Fair Play & Sportsmanship:** Understand discipline and ethics in cricket.	2
13.	**Assessment - VIII**	2
	TOTAL	**26**

Text Books:

1. Sridhar, R., "Coaching Beyond", Rupa Publications India.
Reference Books:
1. Eastaway, R., "Cricket Explained: From Grubbers to Googlies", St. Martin's Griffin.
E-Resources:
1. How to Play Cricket 2. Cricket rules explained in 2 minutes 3. Every Cricket Shot Explained in 21 Minutes

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** IV		
Course: Liberal Learning – IV (Rifle and Pistol Shooting)							**Code:** 25ETCC406H		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To develop safe shooting skills, accuracy, concentration, and proper shooting techniques in students.
2. To build discipline, confidence and prepare shooters for competitive events.

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

CO1	Explain safe rifle handling, range discipline, equipment, and match procedures.
CO2	Demonstrate proper shooting techniques, coordination, and posture.
CO3	Apply mental focus and scientific principles to improve shooting performance.
CO4	Demonstrate discipline, sportsmanship, and overall shooting proficiency.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	**Shot calling:** Shot calling is the ability to mentally identify the exact location of the shot.	2
2.	**Maintain training diary:** To maintain notes given by coach	2
3.	**Pressure handling:** To handle pressure during match, shooters get tensed during match due to crowd or pressure about the performance	2
4.	**Full qualification matches:** Qualifying test match	2
5.	**Final match:** Final match between the qualified shooters	2
6.	**Dry firing test:** To do the whole process of firing the shot but the gun is not loaded	2
7.	**Assessment –VII**	2
8.	**Advanced Accuracy Drills:** It is a structured training exercise designed to improve precision, consistency, shot execution and mental control.	2
9.	**Mock Competition I:** It is a simulated shooting match conducted under actual competition conditions –match no.- **1**	2
10.	**Mock Competition II:** It is a simulated shooting match conducted under actual competition conditions –match no.- **2**	2
11.	**Equipment Inspection and Adjustment:** Learn to adjust the weapon according to the shooter	2
12.	**Ethics and sportsmanship:** It refers to the moral principles ,values, and respectful	2

	behavior that guide shooters during training and competition	
13.	**Assessment – VIII**	2
	TOTAL	**26**

Text Books:

1. International Shooting Sport Federation (ISSF), "ISSF Official Statutes, Rules and Regulations", International Shooting Sport Federation (ISSF)
2. National Rifle Association (NRA), "The NRA Guide to the Basics of Pistol Shooting", National Rifle Association of America
3. National Rifle Association (NRA), "The NRA Guide to the Basics of Rifle Shooting", National Rifle Association of America

Reference Books:

1. National Rifle Association (NRA), "The Fundamentals of Rifle Marksmanship", National Rifle Association of America
2. International Shooting Sport Federation (ISSF), "ISSF Official Statutes, Rules and Regulations", International Shooting Sport Federation (ISSF)
3. National Rifle Association (NRA), "The NRA Guide to the Basics of Pistol Shooting", National Rifle Association of America
4. National Rifle Association (NRA), "The NRA Guide to the Basics of Rifle Shooting", National Rifle Association of America

E-Resources:

1. Introduction to Exercise Physiology & Sports Performance, IIT Madras, https://nptel.ac.in/courses/109106406
2. Open Sight Air Rifle Shooting Sports For Beginners. @TheGunzoneNetwork - YouTube
3. Basics of the Standing Position | Sauer Academy
4. The Ideal Air Rifle Shooter with Abhinav Bindra [IND]

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** IV		
Course: Liberal Learning – IV (Volleyball)							**Code:** 25ETCC406I		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To equip participants with the essential skills and knowledge of volleyball, enabling them to perform fundamental techniques, understand basic rules, and participate in basic gameplay scenarios confidently.

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

CO1	Explain the official rules, referee signals, and scoring procedures of volleyball.
CO2	Demonstrate advanced volleyball skills, fitness components, and position-specific techniques.
CO3	Apply offensive, defensive, and tactical strategies effectively during competitive play.
CO4	Demonstrate proficiency in officiating, teamwork, sportsmanship, and overall match performance.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	**Official Volleyball Rules:** History and development of volleyball rules, Court dimensions and equipment specifications, Team composition and player positions, Rotation and substitution rules, Scoring system (Rally Point System), Faults, violations, and penalties, Service order and match regulations.	2
2.	**Referee Signals:** Duties of the first and second referee, Official hand signals for all game situations, Line judge signals, Communication between officials, Practical demonstration of referee signals.	2

3.	**Score Sheet And Match Procedures:** Components of the official score sheet, Recording player line-ups and substitutions, Recording time-outs, sanctions, and scores, Match protocol before, during, and after play, Practical score sheet filling	2
4.	**Physical Conditioning:** Volleyball-specific warm-up exercises, Strength development for upper and lower body, Core stability exercises, Endurance training, Cool-down and recovery methods.	2
5.	**Speed And Agility And Plyometric:** Sprint drills , Agility ladder exercises, Cone drills , Jump training (plyometrics) , Explosive movement drills for volleyball	2
6.	**Flexibility And Injury Prevention:** Dynamic and static stretching, Mobility exercises, Common volleyball injuries, Injury prevention techniques, Recovery and rehabilitation basics	2
7.	**Assessment - VII**	2
8.	**Position-Specific Training:** Setter responsibilities and drills, Outside hitter techniques, Middle blocker skills, Opposite hitter training, Libero defensive techniques, Position-based game practice.	2
9.	**Complex Offensive System:5**–1 offensive system, 6–2 offensive system, Quick attack combinations, Setter-hitter coordination, Transition offense, Team offensive strategies.	2
10.	**Complex Defensive System:** Block defence system, Perimeter defense, Rotation defense, Backcourt positioning, Defensive communication, Transition from defense to attack.	2
11.	**Tournament Practice:** League and knockout match formats, Tournament scheduling, Team strategy under competition conditions, Match officiating practice, Sportsmanship and fair play.	2
12.	**Comprehensive Skill Revision:** Revision of all technical skills, Tactical system review, Fitness drills, Match-based practice, Error correction and performance improvement	2
13.	**Assessment - VIII**	2
	TOTAL	**26**
Text Books:		

1. Fédération Internationale de Volleyball (FIVB), "Official Volleyball Rules", FIVB Publications 2. Bonnie Kenny & Cindy Gregory, "Volleyball: Steps to Success", Human Kinetics 3. Anita Bean, "The Complete Guide to Sports Nutrition", Bloomsbury Sport 4. Ian Jeffreys, "The Warm-Up", Human Kinetics
Reference Books:
1. Pete Waite, "Aggressive Volleyball", Human Kinetics 2. Bob Bertucci, "Volleyball Drill Book", Human Kinetics
E-Resources:
1. Volleyball Rules : How to Play Volleyball : The Rules of Volleyball EXPLAINED! 2. 6 Basic Skills in Volleyball - YouTube 3. Everything You Need to Know About the Game of Volleyball - YouTube

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech (Electronics and Telecommunication Engineering)							**Semester:** IV		
Course: Liberal Learning – IV (Football)							**Code:** 25ETCC406J		
Teaching Scheme (Hrs/week)				**Evaluation Scheme (Marks)**					
Lecture	**Practical**	**Tutorial**	**Credit**	**CIE**	**ETE**	**TW**	**OR**	**PR**	**Total**
-	02	-	01	-	-	25	-	-	25

Prerequisites:

Proper health, Basic knowledge of rules of the game.

Course Objectives:

1. To enhance football players' technical skills, tactical understanding, physical fitness, teamwork, and sportsmanship, fostering a comprehensive understanding and appreciation of the game.

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

CO1	Demonstrate advanced football skills, position-specific techniques, and physical conditioning.
CO2	Apply leadership, coaching, refereeing, and talent identification skills in football.
CO3	Analyze match statistics, player performance, and team effectiveness using appropriate methods.
CO4	Demonstrate teamwork, fair play, ethics, and overall football proficiency in competitive matches.

Course Contents:

Sr. No.	**Description**	**Duration (Hrs.)**
1.	**Advanced Technical Drills:** Develop advanced football techniques through challenging drills that improve skill execution, speed, accuracy, and game adaptability.	2
2.	**Position-Specific Training:** Understand and apply position-specific skills, roles, and responsibilities to enhance individual performance within the team structure.	2
3.	**Leadership & Captaincy:** Develop leadership qualities, communication skills, and decision-making abilities to effectively guide and motivate teammates.	2

4.	**Football Coaching Methods:** Understand and apply effective coaching methods, session planning, and teaching approaches to improve player development.	2
5.	**Talent Identification:** Understand the principles of talent identification by evaluating technical, physical, tactical, and psychological attributes of players.	2
6.	**Strength & Conditioning:** Develop football-specific strength, endurance, speed, agility, and conditioning to improve athletic performance and reduce injury risk.	2
7.	**Assessment-VII**	2
8.	**Refereeing & Match Officiating:** Understand the laws of the game and develop basic refereeing skills for fair and effective match officiating.	2
9.	**Match Statistics & Performance Analysis:** Analyze match statistics and performance data to evaluate player contributions, team effectiveness, and areas for improvement.	2
10.	**Fair Play & Professional Ethics:** Understand the importance of fair play, respect, discipline, teamwork, and ethical behavior in football.	2
11.	**Tournament Practical:** Apply technical, tactical, physical, and teamwork skills in a competitive tournament environment.	2
12.	**Final Competitive Match:** Demonstrate overall football development by applying skills, tactics, teamwork, and sportsmanship in a competitive match setting.	2
13.	**Assessment-VIII**	2
	TOTAL	**26**

Text Books:

1. Fédération Internationale de Football Association (FIFA), "Laws of the Game", FIFA.
2. International Football Association Board (IFAB), "Laws of the Game", IFAB.

Reference Books:

1. Hughes, C., "The Winning Formula in Soccer", Meyer & Meyer Sport.
2. Fédération Internationale de Football Association (FIFA), "Laws of the Game", FIFA.
3. International Football Association Board (IFAB), "Laws of the Game", IFAB

E-Resources:

1. Beginner's guide to football | Football for dummies
2. Every position in soccer explained

3. Rules Of Soccer : How to play Soccer : Soccer Rules for Beginners

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DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Program: B. Tech. (Electronics and Telecommunication Engineering)									**Semester:** IV
Course: Internship – II									**Code:** 25ETIN402
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.

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