B.Tech. ECE 3rd Semester

Category	Course Code	Course Title	Subject Type	Hours per week			Marks Distribution			Credits
				L	T	P	Int	Ext	Total	
Professional Core Course	25C1ECU-301	Semiconductor Devices & AI Integration	T	3	1	0	40	60	100	4
Professional Core Course	25C1ECU-302	Digital System Design	T	3	1	0	40	60	100	4
Professional Core Course	25C1ECU-303	Data Structures	T	3	0	0	40	60	100	3
Professional Core Course	25C1ECU-304	Probability Theory and Transform Calculus	T	3	1	0	40	60	100	4
NCC	25C1NCU-301	Constitution of India	T	2	0	0	0	0	0	Satisfactory/ Unsatisfactory
Open Elective	25C1XXU-XXX	Open Elective –I (Swayam / NPTEL/MOOCs/ Any other Platform/Department Elective Pool)	T	3	0	0	0	100	100	3
Skill Enhancement	25C1SEU-301	Career & Placement Planning (CPP)-I	P	0	0	2	50	0	50	1
Professional Core Course	25C1ECU-311	Semiconductor Devices & AI Integration Lab	P	0	0	2	30	20	50	1
Professional Core Course	25C1ECU-312	Digital System Design Lab	P	0	0	2	30	20	50	1
Professional Core Course	25C1ECU-313	Data Structure Lab	P	0	0	2	30	20	50	1
Skill Enhancement	25C1ECU-314	Future Skill Lab-I	P	0	0	2	30	20	50	1
Training	25C1SEU-315	Summer Internship-I	P	0	0	6	60	40	100	2
Total				**17**	**3**	**10**	**390**	**460**	**850**	**25**

B.Tech. ECE 4th Semester

Category	Course Code	Course Title	Subject Type	Hours per week			Marks Distribution			Credits
				L	T	P	Int	Ext	Total	
Professional Core Course	25C1ECU-401	Analog Circuits	T	3	1	0	40	60	100	4
Professional Core Course	25C1ECU-402	Analog & Digital Communication	T	3	0	0	40	60	100	3
Humanities & Social Sciences Course	25C1HSU-401	Universal Human Values	T	3	0	0	40	60	100	3
Professional Core Course	25C1ECU-403	Network Theory	T	3	1	0	40	60	100	4
Professional Core Course	25C1ECU-404	Embedded System Design	T	3	0	0	40	60	100	3
Professional Elective	25C1ECU-CE1-XXX	Core Elective-I (Swayam / NPTEL/MOOCs/ Any other Platform/Department Elective Pool)	T	3	0	0	0	100	100	3
Skill Enhancement	25C1SEU-401	Career & Placement Planning (CPP)-II	P	0	0	2	50	0	50	1
Professional Core Course	25C1ECU-411	Analog Circuits Lab	P	0	0	2	30	20	50	1
Professional Core Course	25C1ECU-412	Analog & Digital Communication Lab	P	0	0	2	30	20	50	1
Professional Core Course	25C1ECU-413	Embedded System Design Lab	P	0	0	2	30	20	50	1
Skill Enhancement	25C1SEU-414	Future Skill Lab-II	P	0	0	2	30	20	50	1
Total				**18**	**2**	**10**	**370**	**480**	**850**	**25**

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-301	**Semiconductor Devices & AI Integration**	**PCC**	**4**	**3**	**1**	**0**	**40**	**60**	**100**

Pre-requisite: Basic Knowledge of Basic Electronics

Course Outcomes:

At the end of the course; the student will be able to	
CO1	Explain physics of semiconductors and behaviour of charge carriers within semiconductors.
CO2	Interpret the working and characteristics of semiconductor diodes.
CO3	Compare the working of BJT in common base; common emitter; and common collector configurations.
CO4	Analyze the V–I characteristics of MOSFET devices under different operating regions.
CO5	Estimate the impact of AI-driven techniques on semiconductor device fabrication.

Detailed Syllabus

Unit 1: Semiconductor Physics: Review of energy bands; Conductor; Insulator and semiconductor; Intrinsic and extrinsic semiconductor; e-k diagram; Diffusion current; Drift current; Expression of current in semiconductor; Mobility and resistivity; Sheet resistance. **(6Hrs.)**

Unit 2: Diodes: Generation and recombination of carriers; Qualitative Theory of P-N Junction; Temperature dependence of V-I characteristic; Ideal versus Practical diode; P-N junction characteristics; V-I characteristics; Types of breakdown; Zener diode; Schottky diode; Light Emitting diode; Tunnel diode; Varactor diode; Solar cell. **(7Hrs.)**

Unit 3: Bipolar Junction Transistors: Bipolar junction transistor; PNP and NPN Transistors; Basic Transistor Action; V-I characteristics; Modes of operation; Transistor Configurations-CE; CB; CC; Input and Output Characteristics of CB; CE and CC Configurations; Current Gain and their relationship; Introduction to Simulators. **(8Hrs.)**

Unit 4: Field Effect Transistors**:** JFET; Construction; Idea of Channel Formation; Pinch-Off and Saturation Voltage; Current-Voltage Output Characteristics; MOSFET - types of MOSFETs; Circuit symbols; Working and Characteristic curves of depletion type MOSFET (both N channel and P Channel) and enhancement type MOSFET (both N channel and P channel); Complimentary MOS (CMOS). **(8Hrs.)**

Unit 5: Semiconductor Fabrication: Oxidation; Diffusion; Ion-implantation; Annealing; Photolithography; Etching; Chemical vapour deposition (CVD; Introduction to OSAT. AI in Semiconductor Devices: Introduction to Artificial Intelligence; AI in modern electronics and semiconductor technology. **(7Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Electronics Devices & Circuit Theory	RL Boylestead and L Nashelsky	Pearson Education	11th (2015)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Microelectronic Circuits	Adel S. Sedra and Kenneth C. Smith	Oxford University Press	7th (2014)
2	Electronic Devices and Circuits	Millman and Halkias	Tata-McGraw Hill	4th (2015)
3	Solid State Electronic Devices	G. Streetman; and S. K. Banerjee	Pearson	7th (2024)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-302	**Digital System Design**	**PCC**	**4**	**3**	**1**	**0**	**40**	**60**	**100**

Pre-requisite: Basic knowledge of Electronics

Course Outcomes:

At the end of the course; the student will be able to	
CO1	Simplify digital logic expressions using Boolean algebra and minimization techniques.
CO2	Design combinational circuits such as adders; multiplexers; decoders; encoders; and comparators for specified digital applications.
CO3	Design sequential circuits using flip-flops for digital applications.
CO4	Explain the characteristics of digital logic families and the basic concepts of PLDs; CPLD; and FPGA used in digital system design.
CO5	Illustrate the operation of DACs and ADCs and their role in data conversion within digital electronic systems.

Detailed Syllabus

Unit 1: Boolean Algebra & Logic Simplification: Number Systems and it's representation; Logic Gates and truth tables; Boolean postulates and theorems; SOP & POS forms; Karnaugh-Maps: 2–5 variables; Quine-McCluskey Minimization Method; Gate-level logic simplification. **(6 Hrs.)**

Unit 2: Combinational Logic Circuits: Combinational Circuit Analysis; Design Methodology; Adders; Subtractors; Comparator; Encoder/Decoder; MUX/DEMUX; Code Converters; Arithmetic circuits & ALU; MSI & LSI components. **(6 Hrs.)**

Unit 3: Sequential Logic Circuits: Flip-flops: SR; JK; T; D; Master–slave & edge-triggered FFs; Registers & shift registers; Counters: synchronous & asynchronous; Finite state machines (Mealy/Moore); State diagrams; Reduction & Assignment. **(8 Hrs.)**

Unit 4: Logic Families and Programmable Logic Devices: comparison of TTL; CMOS; and ECL logic families; tri-state logic and bus interfacing; overview of programmable logic devices (PLDs) including PROM; PAL and PLA; Introduction to Complex Programmable Logic Devices (CPLD) and Field Programmable Gate Arrays (FPGA). **(8 Hrs.)**

Unit 5: Data Converters: Digital-to-Analog Converters (DACs): principles of digital-to-analog conversion; architecture and operation of weighted resistor DAC; R–2R ladder DAC and resistor string DAC. Analog-to-Digital Converters (ADCs): fundamentals of analog-to-digital conversion; working principles and characteristics of single slope (ramp) ADC; dual slope ADC; successive approximation ADC and flash ADC; Role of digital systems in IoT; Role of AI in digital systems. **(7 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Digital System Design using VHDL	Charles Roth	PWS Publishing company; Boston	2nd (2008)
2	Digital Electronics	J.S. Katre	Technical Publications Pune	1st (2019)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Modern Digital Electronics	R.P. Jain	Tata McGraw Hill	4th (2010)
2	Digital Electronics- An introduction to theory and practice	W.H. Gothmann	Prentice Hall of India	2nd (2016)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-303	**Data Structures**	**PCC**	**3**	**3**	**0**	**0**	**40**	**60**	**100**

Pre-requisite: Engineering 1st Year/Diploma in relevant branch

Course Outcomes:

At the end of the course; the student will be able to	
CO1	Explain algorithm complexity concepts and implement Linear Search and Binary Search on linear data structures.
CO2	Analyze the operations like insertion; deletion; traversing on stacks and queues and determine their computational complexities.
CO3	Apply operations like searching; insertion; deletion; traversing on various Linked list and determine their computational complexities.
CO4	Implement Trees and Graphs networks to perform various operations on data structure.
CO5	Classify different sorting algorithms and compare their performance in term of Space and time complexity.

Detailed Syllabus

Unit 1: Introduction: Basic Terminologies; Elementary Data Organizations; Data-Structure Operations: insertion; deletion; traversal etc. Analysis of an Algorithm; Asymptotic Notations; Time-Space trade off; Searching: Linear Search and Binary Search Techniques and their complexity analysis; Introduction to pointers and dynamic memory allocation; Use of pointers in self-referential data structures. **(8Hrs.)**

Unit 2: Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis; Applications of Stacks: Expression Conversion and evaluation -corresponding algorithms and complexity analysis. ADT queue; Types of Queue: Simple Queue; Circular Queue; Priority Queue; Operations on each types of Queues: Algorithms and their analysis. **(7Hrs.)**

Unit 3: Linked Lists: Singly linked lists: Representation in memory; Algorithms of several operations; Traversing; Searching; Insertion into; Deletion from linked list; Linked representation of Stack and Queue; Header nodes; Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis. **(8 Hrs.)**

Unit 4: Trees: Basic Tree Terminologies; Different types of Trees: Binary Tree; Threaded Binary Tree; Binary Search Tree; AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis; Applications of Binary Trees. Graph: Basic Terminologies and Representations; Graph search and traversal algorithms and complexity analysis. **(7Hrs.)**

Unit 5: Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort; Bubble Sort; Insertion Sort; Quick Sort; Merge Sort; Heap Sort; Performance and Comparison among all the methods; Hashing; Sorting of data using AI. **(7Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Data Structures and Algorithms in JavaScript	Federico Kereki	No Starch Press	1st (2025)
2	Classic Data Structures	Samanta and Debasis	Tata McGraw Hill	8th (2022)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Data Structures with C	Seymour Lipschutz	Tata McGraw Hill	1st (2014)
2	Algorithms: Data Structures; and Problem Solving with C++	Mark Allen Weiss	Tata McGraw Hill	2nd (2003)
3	Introduction to Algorithms	Thomas H. Cormen; Charles E. Leiserson; Ronald L. Rivest; Clifford Stein	MIT Press/ McGraw-Hill	4th (2022)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-304	**Probability Theory and Transform Calculus**	**PCC**	**4**	**3**	**1**	**0**	**40**	**60**	**100**

Pre-requisite: Engineering 1st Year/Diploma in relevant branch

Course Outcomes:

At the end of the course; the student will be able to	
CO1	Explain the fundamental concepts of probability theory; random variable and probability distribution.
CO2	Classify different types of signals used in electronic circuits.
CO3	Apply the concepts of Fourier Series and transform to solve integral equations.
CO4	Analyze different mathematical functions using Laplace transform.
CO5	Evaluate Z transform for different causal and non-causal system.

Detailed Syllabus

Unit 1: Probability Theory: Probability; Experiments and Sample Spaces; Probability: Mean; median; mode and standard deviation; Combinatorial probability; Probability distribution functions; Events; Probability Definitions; Joint Probability; Conditional Probability. **(6Hrs.)**

Unit 2: Introduction to Signals: Classification of Signals: Periodic and Aperiodic signals; continuous and discrete time signals; continuous and discrete amplitude signals; Even and odd signals; Energy and power Signal; Elementary Signals; Linear and nonlinear Systems; Causal and non-causal Systems. **(6Hrs.)**

Unit 3: Fourier Series and Fourier Transform: Fourier Series; Power series; Polar Fourier series; Exponential Fourier series; Fourier Transform; Magnitude and phase response; Properties of Fourier Transform: Convolution/Multiplication; Duality; Time-shifting; Frequency-shifting **(8Hrs.)**

Unit 4: Laplace transforms: Definition and existence of Laplace transforms; properties of Laplace transform; Unit step function; Impulse function; Laplace transform of periodic functions; Definition of Inverse Laplace Transform; Methods of Finding Inverse Laplace Transform: Partial Fraction Method; Convolution Theorem; System transfer function and poles-zeros analysis; Solution to differential equations and system behaviour. **(9Hrs.)**

Unit 5: Z Transform: Introduction to Z-Transforms; Definition of Z-Transform; Region of Convergence (ROC) for Z-Transform; Z-Transforms of Finite Duration Sequences; Inverse Z-Transform methods; Properties of Z- Transform; Applications of Z transform. **(9Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Signals and Systems	Alan V. Oppenheim	Oxford	2nd (1997)
2	Higher Engineering Mathematics	B. S. Grewal	Khanna Publishers	45th (2025)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Probability; Random Variables & Random Signal Principles	Peyton Z. Peebles Jr.	McGraw-Hill Higher Education	4th (2000)
2	Fundamentals of Digital Signal Processing	Lonnie C. Ludeman	John Wiley & Sons	2nd (2009)
3	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons	10th (2011)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-311	Semiconductor Devices & AI Integration Lab	PCC	1	0	0	2	30	20	50

Pre-requisite: Basic Knowledge of Basic Electronics

Course Outcomes:

At the end of the course; the student will be able to	
CO1	Experiment with different semiconductor diodes and observe their VI characteristics.
CO2	Construct different rectifier circuits to obtain DC output from an AC source.
CO3	Verify the characteristics of a BJT in in common base; common emitter; and common collector configurations.
CO4	Analyze the concept of MOSFETs in electronic circuit applications.
CO5	Design functional electronic circuits using diodes; BJTs; and MOSFETs based on given specifications.

Part- A List of Activities for Semiconductor Devices & AI Integration Lab

S. No.	Activity Title
1	Explain the significance of important datasheet parameters such as maximum ratings and electrical characteristics.
2	Plot the V–I characteristics of a PN junction diode using experimental data.
3	Construct the circuit and plot the characteristics of a Zener Diode. Find the breakdown voltage.
4	Construct a half-wave rectifier and obtain the output waveform.
5	Judge the suitability of a diode switch for the circuit.
6	Construct full-wave rectifier circuits and observe output waveforms.
7	Construct a Bridge Rectifier and observe output waveforms.
8	To study and plot the characteristics of LED.
9	Plot input and output V–I characteristics of an NPN/PNP BJT in CE mode.
10	Obtain and plot the V–I characteristics of a BJT in CB configuration.
11	To study Input & output V-I characteristics of NPN/PNP BJT in CC configuration.
12	Explain the operation of a BJT as a switching device.
13	Plot the drain and transfer characteristics of a MOSFET.
14	Simulate half wave; full wave and bridge rectifier using simulation tool like PSpice/ Orcad/Multisim/any other simulator.
15	To fabricate PCB and testing of electronics circuit on PCB.
16	To generate and display an AC waveform superimposed on a DC level.

Part-B: Lab Projects

Every individual student is required design and build one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. Blinking linear/circular lights
2. Ambient light sensor-based controller
3. Regulated dual power supply of ±5V or ±12V or mixed
4. BJT audio amplifier
5. BJT circuit for sampling of analog signal
6. Simulate any project idea

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-312	**Digital System Design Lab**	**PCC**	**1**	**0**	**0**	**2**	**30**	**20**	**50**

Pre-requisite: Engineering 1st Year/Diploma in relevant branch

Course Outcomes:

At the end of the course; the student will be able to	
CO1	Design combinational digital circuits using logic gates.
CO2	Design sequential digital circuits such as flip-flops and counters.
CO3	Simulate VHDL programs for combinational and sequential circuits.
CO4	Develop working digital circuit projects using 74XX series ICs.
CO5	Implement digital circuits such as adders and multiplexers using LabVIEW.

Part- A List of Activities for Digital System Design Lab

S. No.	Activity Title
1	To verify the Truth-tables of all logic gates.
2	To realize and verify the Half & full adder circuits using logic gates.
3	To realize Half & full subtractor circuits using logic gates.
4	To realize 4-bit binary-gray & gray-binary converters.
5	To realize comparator circuit for two binary numbers of 2-bit each.
6	To realize Full adder & full subtractor circuits using 8x3 Encoder.
7	To design Full adder & full subtractor circuits using 8x3 Demultiplexer.
8	To design and verify the Truth tables of all flip-flops.
9	To design Mod-6/Mod-9 synchronous up-down counter.
10	To write VHDL program for combinational circuits from S. No. 2 to 7.
11	To write VHDL program for sequential circuits from S.No. 8 and 9.
12	To Design and Implement 4-bit adder using simulation.
13	To Realize 4:1 and 8:1 Multiplexers using simulation.

Part-B: Lab Projects

Every individual student is required to design one Lab Project under the supervision of course teacher. Topic of the project may be any from the Digital System Design theory contents on real time issues/problems.

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-313	Data Structures Lab	PCC	1	0	0	2	30	20	50

Pre-requisite: Engineering 1st Year/Diploma in relevant branch

Course Outcomes:

At the end of the course; the student will be able to	
CO1	Experiment with the basic of Data Structure fundamentals.
CO2	Analyze operations like insertion, deletion, traversing on Stacks and Queues in data structures and determine their computational complexities.
CO3	Apply operations like searching, insertion, deletion, traversing on various Linked lists.
CO4	Implement various operations like traversal, insertion on Trees.
CO5	Design algorithms for sorting methods on Trees.

Part- A List of Activities for Data Structures Lab

S. No.	Activity Title
1	Implement Linear Search operation in an array.
2	Implement Binary search operation in an array.
3	Write a program to implement Insertion Sort in an array.
4	Implement the operation of traversing a linear array
5	Write a program to implement Selection Sort in an array.
6	Sorting of linear array using Bubble Sort.
7	Sorting of linear array using Quick sort.
8	Sorting of linear array using Merge sort.
9	Insertion of elements in Stack.
10	Deletion of elements in Stack.
11	Insertion of elements in Queue.
12	Deletion of elements in Queue.
13	Write a program to implement Singly Linked List.
14	Write a program to implement Doubly Linked list.
15	Write a program to implement Binary Search Tree.

Part-B: Lab Projects

Every individual student is required design and build one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. Student Record Management System
Use arrays; linked lists; and searching/sorting algorithms.
2. Library Management System
Implement stacks; queues; and hash tables for book tracking.
3. Polynomial Addition using Linked List
Represent polynomials as linked lists and perform operations.
4. Expression Evaluation using Stack
Convert infix to postfix and evaluate expressions.

Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-314	Future Skills Lab-I	Skill Enhancement	1	0	0	2	30	20	50

Course Outcomes

At the end of the course; the student will be able to	
CO1	Apply CAD modelling; and additive manufacturing techniques to design and fabricate simple components.
CO2	Analyze fabricate; and assemble basic electronic circuits including schematic development; PCB layout; and PCB prototyping.
CO3	Make use of electronic test and measurement instruments to analyze electrical parameters and signal characteristics.
CO4	Recall fundamental concepts of number systems, basic PLC hardware components and ladder logic symbols.
CO5	Explain the working principles of PLC systems, including iQ-F/iQR series configuration, ladder logic programming and HMI interfacing using GX Works3.

Part- A List of Activities for Future Skills Lab

S. No.	Activity Title
1	Design and fabricate a flat component on acrylic/wood using laser cutting machine
2	Design and fabricate a two-dimensional profile using a vinyl cutting plotter.
3	Draw schematic and PCB layout of a electronic circuit.
4	Fabricate a single-layer printed circuit board using PCB milling/prototyping equipment.
5	Perform electronic component assembly using a soldering station and verify circuit continuity.
6	Generate standard waveforms using a signal/function generator and observe them using a digital storage oscilloscope.
7	Interpret the fundamental concepts of number systems by examining different types and convert numbers between these systems for usage in digital systems.
8	Apply knowledge of hardware modules and components of the iQR series PLC and connection procedures to establish a functional PLC setup for basic control applications.
9	Recall and list the fundamental symbols and instructions used in basic ladder logic programming to represent simple control operations in a PLC.
10	Analyze the process of programming and interfacing the iQ-F PLC with HMI using GX Works for real-time monitoring and control.
11	Evaluate the performance of an induction motor by controlling its speed and direction using an inverter kit.
12	Apply PLC pulse train output to control a servo system for achieving precise position and motion control.

Part-B: Lab Projects

Every individual student is required design and build one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. USB Powered LED Night Lamp
2. Continuity Tester Device
3. Mobile Phone Charger Indicator Board
4. Mini Audio Amplifier Board
5. DC Motor Speed Indicator
6. Smart traffic control using PLC

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1NCU-301	Constitution of India	NCC	S/NS	2	0	0	0	0	0

Pre-requisite: Basic understanding of science and engineering fundamentals

Course Outcomes:

At the end of the course; the student will be able to	
CO1	Summarize the emergence, evolution, structure, and composition of the Indian Constitution.
CO2	Analyze the concept and functioning of federalism in the India as provided in the Constitution.
CO3	Classify the Panchayati Raj institutions as instruments of decentralization and the roles of the three organs of the state in the contemporary scenario.
CO4	Explain the Indian political scenario in the context of emerging challenges.
CO5	Elaborate Indian foreign relations under the cold war and post-cold war era.

Detailed Syllabus

Unit 1: Introduction to Indian Constitution: Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947, Composition of the Constituent Assembly, Functions of the Constituent Assembly, Various Committees of the Constituent Assembly, Enforcement of the Constitution, Indian Constitution and its Salient Features. **(8 Hrs.)**

Unit 2: The role of B R Ambedkar in the making of the Indian Constitution, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Gandhian Principles, Liberal Principles, Socialistic Principles. **(8 Hrs.)**

Unit 3: Indian Federalism: Meaning and Definition of Federalism, Structure and Features of Indian Federalism, Difference between Indian and Federation of other states, Difference between federal and unitary features, Critical Evaluation of the Indian Federal System, Decentralisation of Powers, Centre-State Relations, 73rd Amendment, Panchayath Raj Institutions. **(8 Hrs.)**

Unit 4: Union Government: Powers of Indian Parliament, Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister. **(8 Hrs.)**

Unit 5: India's External Relations - Cold War and Post-Cold War era: What is Foreign Policy? Basic Determinants of Foreign Policy, Indian and its Neighbours, India's Extended Neighbourhood in West Asia and South-East Asia, India's relations with the United States and Russia, India and the World Organisations, India in the 21st century. **(8 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Constitution of India	The Constitution of India, 1950 (Bare Act)	Government Publication.	-
2	Working of a Democratic Constitution of India.	Granville Austin	Oxford University Press, New Delhi	1st (2003)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Contemporary India: Economy, Society, Politics	N. Chandhoke & Priyadarshini	Pearson Education India	1st (2009)
2	Understanding Contemporary India: Critical Perspectives	A. Vanaik & R. Bhargava	Orient Blackswan	1st (2010)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1SEU-301	**Career and Placement Planning -1**	**Value Added**	**1**	**0**	**0**	**2**	**50**	**0**	**50**

Pre-requisite: Basic knowledge of arithmetic operations, elementary mathematics and fundamental logical reasoning skills required for problem solving and analytical thinking.

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Demonstrate mental calculation techniques and mathematical shortcuts to simplify and solve numerical expressions efficiently.
CO2	Analyze coded information and spatial relationships to interpret patterns and determine accurate logical conclusions.
CO3	Apply numerical properties and mathematical methods to solve problems involving factors, multiples, divisibility rules, and HCF–LCM relationships.
CO4	Illustrate quantitative relationships to solve problems involving averages, proportional reasoning, and real-life numerical situations.
CO5	Evaluate patterns and logical sequences to identify inconsistencies and determine the correct classification.

Detailed Syllabus

Unit 1: Vedic Mathematics & Simplification: - Simplification & Approximation, Fractions, Decimals and Percentages. Number System**:** - Types of Numbers, Divisibility Rules, Factors and Multiples, Remainders, Unit Digit Problems. Arithmetic Applications**:** - Profit, Loss and Discount, Simple Interest and Compound Interest, Partnership, Time and Work, Time, Speed and Distance, Boats and Streams. Algebra & Advanced Quant**:** - Quadratic Equations, Sequence and Series, Permutation and Combination, Probability. **(8Hrs.)**

Unit 2: Coding Decoding: - Introduction to Coding Decoding, Types of Coding Decoding (Letter, Number, Symbol, Mix), Coding Decoding Techniques (Pattern Recognition, Substitution, Logical Reasoning based), Advanced Coding & Decoding Patterns. Directions: - Introduction to the concept of directions, Types of Directions, Cardinal Directions (N,S,E,W), Intermediate Directions (NE,NW,SE,SW), Movement- Clockwise, Anticlockwise, Shortest Distance & Direction. **(7Hrs.)**

Unit 3: HCF-LCM: Introduction to the concept of HCF-LCM, Finding LCM-HCF (Prime Factorization, Division Method). HCF-LCM of Fractions, Relation between HCF-LCM and Problems, Co-Primes. **(4Hrs.)**

Unit 4: Averages: - Introduction to the concept of Averages, Finding Averages (Formula & Approximation Techniques), Problems on Averages. Ages: - Introduction to the Ages Problems, Types of Problems (Simple, Age Ratio, Age Difference), Techniques for solving. Ratio and Proportion: Introduction to Ratio & Proportion, Combining of Ratios, Comparison of Ratio,

Duplicate, Sub Duplicate, Triplicate, Sub Triplicate Ratio, Problems on Ratio & Proportions, Mean Proportional. **(8Hrs.)**

Unit 5: Odd Man Out: - Introduction to odd man out, Types of patterns & Techniques (Letter Series, Number Series), Identifying Patterns. **(3Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Quantitative Aptitude for Competitive Examinations by R.S. Aggarwal	R.S. Aggarwal	S Chand and Company Ltd	Revised Edition 2025
2	A Modern Approach to Verbal & Non-Verbal Reasoning by R.S. Aggarwal	R.S. Aggarwal	(S. Chand)	2nd (2018)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Quantitative Aptitude & Logical Reasoning	TPP Department	TPP	6th Edition
2	Fast Track Objective Arithmetic by Rajesh Verma (Arihant)	Rajesh Verma	Arihant Publications (India) Ltd	Latest Edition-2025-2026

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-401	**Analog Circuits**	**PCC**	**4**	**3**	**1**	**0**	**40**	**60**	**100**

Pre-requisite: Basic Knowledge of Basic Electronics

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Explain the working of diode circuits and amplifiers based on their characteristics and functions.
CO2	Classify different biasing techniques and signal models of BJT and FET.
CO3	Apply principles of diverse amplifiers in different feedback topologies.
CO4	Analyze the performance of sinusoidal and non-sinusoidal oscillators.
CO5	Compare different types of power amplifiers in terms of their efficiency and distortion.

Detailed Syllabus

Unit 1: Diode Circuits and Amplifier Fundamentals: Diode Circuits; Rectifiers with Filter Circuits; Clippers And Clampers; Zener Diode as Voltage Regulation; Introduction to Amplifiers; Types of Amplifiers; Voltage Amplifier; Current Amplifier; Transconductance Amplifier; Trans-resistance Amplifier; Amplifier Parameters- Voltage Gain; Current Gain; Input Resistance; Output Resistance. **(6 Hrs.)**

Unit 2: Transistor Amplifiers and Frequency Response: Operating point; the D.C and A.C Load lines; Need for biasing schemes; BJT biasing methods; FET biasing methods; Bias stability and thermal stability; transistor amplifier configurations; CE/CS and their features; CB/CG and their features; CC/CD and their features; Transistor models; Small-signal analysis of BJT and FET amplifiers. **(7 Hrs.)**

Unit 3 Feedback Amplifiers: Feedback topologies: Voltage series; Current series; Voltage shunt and current shunt feedback; Effect of feedback on gain; Bandwidth; Input & Output impedances; Concept of stability. **(8 Hrs.)**

Unit 4: Oscillators: Introduction; Types of Oscillators; Barkhausen criterion; RC-phase shift; Wien bridge; Hartley; Colpitts; Clapp oscillators and Non-sinusoidal oscillators. **(8 Hrs.)**

Unit 5: Power Amplifiers: Class A; B; AB and C power amplifiers; their efficiency and distortions; Frequency response: Single stage; Multistage amplifiers; IoT Sensor & Protection Circuits. **(7 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Integrated Electronics: Analog and Digital Circuits and Systems	Jacob Millman; Christos C. Halkias	Tata McGraw-Hill Education Pvt. Ltd.	2nd (2017)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Electronic Devices and Circuit Theory	Robert L. Boylestad; Louis Nashelsky	Pearson Education	11th (2019)
2	Electronic Devices	Thomas L. Floyd	Pearson Education	10th (2018)
3	Microelectronics; 2nd Edition	Jacob Millman& Arvin Grabel	McGraw-Hill	2nd (2022)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-402	Analog & Digital Communication	PCC	3	3	0	0	40	60	100

Pre-requisite: Basic knowledge of Electronics

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Compare the different amplitude modulation schemes on the basis of their efficiency and bandwidth.
CO2	Explain different angle modulation techniques in Am, FM and PM.
CO3	Analyze the different pulse modulation and digital transmission techniques.
CO4	Apply the concepts of information theory and coding in communication system.
CO5	Evaluate different digital modulation schemes for their bit error performance.

Detailed Syllabus

Unit 1: Amplitude Modulation: Review of Signals and Systems; Frequency domain representation of signals; Transmission and Reception of DSB; SSB and VSB; Noise in amplitude modulation. **(6 Hrs.)**

Unit 2: Angle Modulation: Spectral characteristics of angle modulated signals; Principles of Frequency and Phase Modulation; Representation of FM and PM signals; Review of white noise characteristics; Noise in Angle Modulation systems; Pre-emphasis and De-emphasis. **(8 Hrs.)**

Unit 3: Pulse Modulation and Digital transmission of Analog Signal: Need of Analog to Digital; Sampling process; Pulse Amplitude modulation and Concept of Time division multiplexing; Pulse code modulation (PCM); Differential pulse code modulation. Delta modulation and demodulation; Adaptive and Sigma Delta Modulation; Noise considerations in PCM; Inter symbol Interference. **(10 Hrs.)**

Unit 4: Digital Coding Techniques: Hartley Shannon Law; Concept of amount of Information and entropy; Shannon Fano Source Coding; Huffman source coding and Lampel-Ziv Source coding algorithm; Line Coding & its properties; NRZ & RZ types; Signalling format for unipolar; Polar; Bipolar (AMI) & Manchester coding and their power spectra. **(8 Hrs.)**

Unit 5: Digital Modulation Techniques: Amplitude Shift Keying; Phase Shift Keying; Frequency Shift Keying; Quadrature Amplitude Modulation; Continuous Phase Modulation and Minimum Shift Keying; Probability of Error evaluations; Digital modulation techniques used in Wi-Fi; Bluetooth and LTE networks; Introduction to AI in communication systems. **(10 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Communication Systems	Simon Haykin and Michel Moher	John Wiley	5th (2009)
2	Communication Systems Engineering	Proakis J. G. and Salehi M.	Pearson Education	2nd (2015)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Principles of Communication Systems	Taub H. and Schilling D.L.	Tata McGraw-Hill	4th (2001)
2	Digital and Analog Communication Systems	Leon W. Couch	Macmillan Coll Div.	4th (1993)
3	Modern Digital and Analog Communication Systems	B. P. Lathi	Oxford	4th (2011)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-403	Network Theory	PCC	4	3	1	0	40	60	100

Pre-requisite: Basic knowledge of Electronics

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Explain electrical circuits using mesh and nodal analysis with both dependent and independent sources for DC and AC networks.
CO2	Identify the time-domain response of electrical circuits, including their transient and steady-state behaviour.
CO3	Analyze the parameters of any two-port network for effective circuit characterization.
CO4	Evaluate different filters, focusing on their characteristics, implementation, and application in electronic circuits.
CO5	Design one-port networks effectively using Foster's and Cauer's methods and application of theoretical principles to practical circuit synthesis.

Detailed Syllabus

Unit 1: Network Theorems: Node and mesh analysis with independent and dependent sources; Network Reduction - Source transformation – Star-Delta transformation; Network theorems: superposition; reciprocity; Thevenin's; Norton's; Maximum power Transfer; as applied to AC circuits; Automated theorem selection in CAD tools. **(8 Hrs.)**

Unit 2: Transient & Steady State Analysis*:* Transient behaviour; concept of complex frequency; Driving points; Poles and Zeros; Laplace transforms and properties: singularity functions; waveform synthesis; time domain analysis of RC; RL & RLC networks with and without initial conditions; Laplace Transforms for steady state and transient response of networks; quality factor. **(8 Hrs.)**

Unit 3: Two Port Networks: Two-port Networks: Z; Y; ABCD and h parameters; Characteristic impedance; Image transfer constant; image and iterative impedance; network function; driving point and transfer functions – using transformed (S) variables; Poles and Zeros. Standard T; π; L Sections. **(8 Hrs.)**

Unit 4: Filters: Classification Of Filters; Filter Networks; Constant-K Filters-Low Pass; High Pass; Band Pass; Band-Stop Filters; M-Derived Filters- T And Π Filters- Low Pass; High Pass. **(8 Hrs.)**

Unit 5: Network Synthesis: Reliability Criteria: Poles; Zeros Analysis of Network Functions; Hurwitz Polynomial; Positive Real Functions; Network Realization Using Foster's First and Second Forms; Network Synthesis Using Cauer's First And Second Forms; Introduction to AI-based stability prediction using pole-zero data. **(10 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Circuit Theory - Analysis and Synthesis	A. Chakrabarti	Dhanpat Rai Publishing Co Pvt Ltd.	7th (1999)
2	Network Analysis	M. E. Van Valkenburg	Prentice Hall India Private Limited;	3rd (1999)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Circuits and Network	A. Sudhakar; SP Shyammohan;	Tata McGraw-Hill	6th (2025)
2	Networks and Systems	D. Roy Chaudhary	New Age International Publisher	3rd (1999)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-404	**Embedded System Design**	**PCC**	**3**	**3**	**0**	**0**	**40**	**60**	**100**

Pre-requisite: Basic knowledge of Digital Electronics

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Explain the architecture & functions of different building blocks of 8085 Microprocessor.
CO2	Identify the working of different building blocks of 8051 microcontroller.
CO3	Apply assembly language programming skills to develop arithmetic, logical, timer, and interrupt-based operations.
CO4	Design microcontroller based systems by interfacing peripherals like ADC, DAC, Sensors and Motors.
CO5	Interpret concepts of microcontroller to check the capabilities for the development circuit based on arduino, raspberry Pi, and PIC microcontrollers.

Detailed Syllabus

Unit 1: Microprocessor 8085: History of Microprocessors; Microprocessor 8085 Architecture; Pin Configuration; Memory Interfacing; Microprocessor Programming Model; 8085 Instructions; Addressing Modes; Programming Techniques; Counters and Time Delays; Stack and Subroutines; Interrupts. **(8 Hrs.)**

Unit 2: Microcontroller 8051-Building Blocks: Microprocessor Vs. microcontroller; RISC vs CISC architectures; microcontroller 8051: architecture; pin configuration; flag-bits and PSW register; input-output ports; register banks and stack; Introduction to 8951 Microcontroller and its architecture; semiconductor memories: ROM; SRAM; DRAM; virtual memory; cache memory; memory organization. **(8 Hrs.)**

Unit 3: Microcontroller 8051: Programming: Assembly language programming; data types and directives; jump loop and call instructions; I/O port programming; addressing modes and accessing memory using various addressing modes; arithmetic instructions and programs; logic instructions and programs; single bit instructions and programming; 8051 interrupts; timer/counter programming in the 8051 **(8 Hrs.)**

Unit 4: Microcontroller 8051-Interfacing: Parallel and serial ADC & DAC interfacing; LCD interfacing; Keyboard interfacing; sensor interfacing; interfacing with external memory; matrix keypad; stepper motor interfacing; DC motor interfacing and PWM. **(8 Hrs.)**

Unit 5: Introduction to Modern Microcontrollers (Arduino; Raspberry Pi; and PIC): Introduction to Arduino Platform; Digital I/O; Analog I/O; and Serial Communication in Arduino; Getting Started with Raspberry Pi; PIC Microcontroller Basics: Architecture; Programming Tools, Role of microprocessors in Internet of Things. **(10 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Microprocessor Architecture; Programming and Application with 8085	R S Gaonkar	Penram International Publishing Pvt. Ltd.	7th (2022)
2	The 8051 Microcontroller	Kenneth Ayala	Cengage Learning	4th (2021)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	8051 Microcontroller (Internals; Instructions; Programming and Interfacing)	Subrata Ghoshal	Pearson India	2nd (2024)
2	Modern Digital and Analog Communication Systems	B. P. Lathi	Oxford	4th 2011)
3	Microprocessors Interfacing	Douglas Hall	Tata McGraw- Hill	4th (2022)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-CE1-XXX	Signals and Systems	PEC	3	3	0	0	0	100	100

Pre-requisite: Basic knowledge of Electrical/Electronic circuit

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Explain different types of signals and systems used in Communication System
CO2	Summarize the behaviour of linear-shift invariant systems using Convolution and System Properties
CO3	Apply concepts of Fourier and Laplace Transforms for mathematical signals.
CO4	Examine the concept of sampling and Discrete-Time Fourier Transforms for different discrete time signals and system
CO5	Evaluate discrete-time LTI systems using convolution sum and Z-Transform, including system functions.

Detailed Syllabus

Unit 1: Introduction to Signals and Systems: Classification of Signals: Periodic and Aperiodic signals; continuous and discrete time signals; continuous and discrete amplitude signals; Linear and nonlinear signals; Causal and non-causal signals; Even and odd signals; Energy and power signals; System properties: linearity; shift-invariance; causality; stability. **(9 Hrs.)**

Unit 2: Linear-Shift Invariant Systems: Linear shift-invariant systems; Impulse response and step response; Convolution; Input-output behaviour with Aperiodic convergent inputs; Characterization of causality and stability of LSI systems; difference equations; Periodic inputs to an LSI system. **(9 Hrs.)**

Unit 3: Continuous-Time Analysis of Signals and Systems**:** Fourier Series; Fourier Transform; Magnitude and phase response; Properties of Fourier Transform: Convolution/Multiplication; Duality; Time-shifting; Frequency-shifting; Time-scaling; Integration and differentiation in time-domain; Review of Laplace Transform for continuous-time signals and systems; Solution to differential equations and system behaviour. **(8 Hrs.)**

Unit 4: Discrete-Time Analysis of Signals and Systems: Sampling theorem and its proof; Spectra of sampled signals; Aliasing and its effects; Reconstruction and its implications. Discrete-Time Fourier Transform (DTFT); Discrete Fourier Transform; Parseval's Theorem. **(8 Hrs.)**

Unit 5: Linear Time Invariant Discrete Time Systems: Impulse Response, System representation through differential equations, Convolution Sum, Review of Z-Transform for discrete-time signals and systems; System functions; Region of convergence and z-domain analysis; Introduction of AI/ML-based signal analysis. **(8 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Signals and Systems	Allan V. Oppenheim; S. Wilskyand S. H. Nawab	Pearson Education	2nd (2015)
2	Signals and Systems	I J Nagrath; S N Sharan; R Ranjan S Kumar	Tata McGraw-Hill	2nd (2012)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Signals and Systems	S Poorna Chandra; B Sasikala	Tata McGraw-Hill	3rd (2010)
2	Signals and Linear Systems	Robert A. Gabel; Richard A. Roberts	John Wiley and Sons	3rd (1987)
3	Signal Processing and Linear Systems	B.P. Lathi	Oxford University Press	2nd (2021)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-CE1-XXX	**Radar Engineering**	**PEC**	**3**	**3**	**0**	**0**	**0**	**100**	**100**

Pre-requisite: Basic knowledge of Electronics

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Explain the basic principle, components and operation of radar system.
CO2	Identify the different types of the radar systems.
CO3	Analyze the operation of MTI radar and Pulse Doppler radar.
CO4	Compare the characteristics of different tracking radar systems and mono pulse radar.
CO5	Evaluate radar signal detection in noise and performance of a radar receiver.

Detailed Syllabus

Unit 1: Basics of Radar: Basic radar; The simple form of the radar equation; Radar block diagram and operation; radar frequencies; Applications of radar; Signal to Noise Ratio; Integration of radar pulses; Radar cross-section of targets; Radar cross section fluctuations; Transmitter power; Pulse repetition frequency and range ambiguities; System losses. **(10 Hrs.)**

Unit 2: CW and Frequency Modulated Radar: The Doppler effect; CW radar; Frequency modulate DCW radar; Airborne doppler navigation; Multiple–frequency CW radar. **(6 Hrs.)**

Unit 3: MTI And Pulse Doppler Radar: Introduction to doppler and MTI radar; Delay line cancellers; staggered pulse repetition frequencies; Range gated doppler filters; Digital MTI processing; Moving target detector; Limitations of MTI performance; Pulse doppler radar. **(7 Hrs.)**

Unit 4: Tracking Radar: Tracking with radar; Sequential lobbing conical scan and mono pulse tracking; Target reflection characteristics and angular accuracy low angle tracking; Tracking in range. **(8 Hrs.)**

Unit 5: Receivers and Detection of Radar Signals in Noise: The radar receiver; Noise figure; Mixers; Low noise front ends; Displays; Duplexers and receiver protectors; Matched filter receiver; Correlation detection; Detection criteria; Detector characteristics; Performance of radar operator; Automatic detection; Introduction to AI based Radar System. **(8 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Introduction to Radar systems	MerrillI. Skolnik	Tata McGraw - Hill	3rd (2002)
2	Principles of Modern Radar	Mark A. Richards & William L. Melvin	SciTech Publishing	2nd (2022)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Radar Principles	Peyton Z. Peebles Jr.	John Wiley & Sons Inc	2nd (2004)
2	Modern Radar Systems	Henning D. Griffiths & C. J. Baker	Artech House Publishers	2nd (2008)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-CE1-XXX	**Biomedical Engineering**	**PEC**	**3**	**3**	**0**	**0**	**0**	**100**	**100**

Pre-requisite: Basic Electronics & Basic Human Physiology

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Explain the principles of medical instrumentation systems and the basic functioning of cardiovascular, nervous, and respiratory systems.
CO2	Identify biomedical sensors and signal acquisition systems used in biomedical instrumentation.
CO3	Analyze the principles and applications of clinical measurement and therapeutic equipment used in healthcare.
CO4	Compare different principles and working of medical imaging systems used for diagnosis of internal body structures.
CO5	Apply patient safety standards and maintenance procedures in biomedical systems.

Detailed Syllabus

Unit 1: Introduction to Biomedical Systems: Basic components of medical instrumentation system; Static and dynamic characteristics; Bio-signals and their characteristics; Measurement problems in living systems; Resting and action potentials; Overview of cardiovascular; nervous and respiratory systems. **(8 Hrs.)**

Unit 2: Bioelectric Signals; Electrodes and Transducers: Electrode-electrolyte interface and equivalent circuits; Surface; Needle and micro electrodes; Physiological transducers; ECG lead configurations; EEG 10–20 system; EMG acquisition; Plethysmography. **(7 Hrs.)**

Unit 3: Clinical Measurements and Therapeutic Equipment: Blood pressure measurement (invasive and non-invasive); Blood flow meters; Pulse oximeter; Pacemakers; Defibrillators; Ventilators and ICU monitors. **(8 Hrs.)**

Unit 4: Medical Imaging Systems**:** X-ray imaging; Computed Tomography (CT); Magnetic Resonance Imaging (MRI); Ultrasound imaging; Endoscopy; Thermography; Comparison of imaging modalities. **(7 Hrs.)**

Unit 5: Patient Safety and Biomedical Equipment Maintenance: Electrical safety; Macroshock and microshock; Grounding and isolation; Equipment maintenance and calibration; Intensive care monitoring systems; Modern trends: wearable devices and telemedicine. **(6 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Handbook of Biomedical Instrumentation	R.S. Khandpur	Tata McGraw-Hill	3rd (2024)
2	Biomedical Instrumentation and Measurements	Leslie Cromwell et al.	Pearson Education	2nd (2016)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Biomedical Instrumentation	M. Arumugam	Anuradha Publications	2nd (2016)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-CE1-XXX	Routing and switching	PEC	3	3	0	0	0	100	100

Pre-requisite: Basic knowledge of Electronics

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Explain the small and medium-sized networks including their general network technologies.
CO2	Classify network connections using advance technologies.
CO3	Categorize networks and integrate voice, wireless and storage technologies in order to support a variety of applications.
CO4	Analyse the network solution for a given problem related to enterprise network.
CO5	Determine network security in routing and security networks.

Detailed Syllabus

Unit 1: Network Fundamentals: Basics of network architecture; enterprise network constructs; Ethernet framing; IP addressing; Internet Control Message Protocol; Address Resolution Protocol; Transport Layer Protocols; Data Forwarding Scenario; Navigating the CLI; File System Navigation and Management; VRP Operating System Image Management; Introduction to Software defined networking (SDN). **(6 Hrs.)**

Unit 2: Network Connections: Establishing a Single Switched Network; Spanning Tree Protocol; Rapid Spanning Tree Protocol; Segmenting the IP Network; IP Static Routes; Distance Vector Routing with RIP; Link State Routing with OSPF; DHCP; FTP and Telnet Protocols; Simple Network Management Protocol; Introducing IPv6 Networks; IPv6 Routing Technologies. **(8 Hrs.)**

Unit 3: Network Construction: Link Aggregation; VLAN Principles; GARP and GVRP; VLAN Routing; Wireless LAN Overview; Bridging Enterprise Networks with Serial WAN Technology; Frame relay principles. **(8 Hrs.)**

Unit 4: Network Solutions: Wireless LAN Overview; Bridging Enterprise Networks with Serial WAN Technology; Frame Relay Principles; Establishing DSL/ADSL Networks with PPPoE; Network Address Translation; Establishing Enterprise Radio Access Network Solutions; Expanding the Enterprise Network; Application services of Enterprise network. **(7 Hrs.)**

Unit 5: Network Security: Access Control Lists; Authentication; Authorization and Accounting (AAA); Securing Data with IPsec and VPN; Generic Routing Encapsulation; Introduction to zero trust security. **(6 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Computer Networks	Andrew S. Tanenbaum; David J. Wetherall	Pearson	6th (2021)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Internetworking with TCP/IP	Douglas Comer	Prentice Hall of India	6th (2015)
2	Data Communication and Networking	Behrouz A. Forouzan	McGraw- Hill	4th (2007)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-CE1-XXX	Computer Organization & Architecture	PEC	3	3	0	0	0	100	100

Pre-requisite: Basic knowledge of Digital electronics

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Explain the basic structure and functional units of a computer system.
CO2	Classify hardwired and micro-programmed control units.
CO3	Evaluate the performance matrices of CPU using pipelining and parallel processing.
CO4	Analyze the memory hierarchy, cache memory technique to improve the system performance.
CO5	Compare different peripherals and their characteristics to interface with microcomputers.

Detailed Syllabus

Unit 1: Functional Blocks of a Computer: CPU; memory; input-output subsystems; control unit. Instruction set architecture of a CPU – registers; instruction execution cycle; addressing modes; instruction set; Data representation: signed number representation; fixed and floating point representations; character representation. Computer arithmetic – integer addition and subtraction; ripple carry adder; carry look-ahead adder; etc. multiplication – shift-and add; Booth multiplier; carry save multiplier; Division restoring and non-restoring techniques; floating point arithmetic. **(9 Hrs.)**

Unit 2: Processor Organization and Micro-program Design Approach: CPU control unit design: Hardwired and micro-programmed design approaches; Register transfer language; Register transfer Bus and Memory transfer; Arithmetic microoperations; Logic and shift microoperations; Control memory and address sequencing. **(8 Hrs.)**

Unit 3: Pipelining: Basic concepts of pipelining; Throughput and speedup; Pipeline hazards; Introduction to parallel processors; Concurrent access to memory and cache coherency; Introduction to Advanced Branch Prediction Techniques. **(8 Hrs.)**

Unit 4: Semiconductor Memory Organization: Semiconductor memory technologies; Memory organization; Memory interleaving; Concept of hierarchical memory organization; Cache memory; Cache size vs. block size; Mapping functions; Replacement algorithms; Write policies. **(8 Hrs.)**

Unit 5: Peripheral Devices and their Characteristics: Input-output subsystems; I/O device interface; I/O transfers- program controlled; interrupt driven and DMA; privileged and non-privileged instructions; Software interrupts and exceptions. Programs and processes –role of interrupts in process state transitions; I/O device interfaces – SCII; USB; Introduction to Hardware Acceleration for AI/ML. **(6 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Computer Organization and Architecture	Moris Mano	John Wiley	5th (2009)
2	Computer Organization and Design: The Hardware/Software Interface	David A. Patterson and John L. Hennessy	Elsevier	2nd (2015)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Computer Architecture and Organization	John P. Hayes	Tata McGraw-Hill	4th (2001)
2	Computer System Design and Architecture	Vincent P. Heuring and Harry F	Pearson education	4th (1993)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-411	Analog Circuits Lab	PCC	1	0	0	2	30	20	50

Pre-requisite: Basic Knowledge of Basic Electronics

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Experiment with semiconductor devices such as diodes, BJTs and FETs with their characteristics.
CO2	Illustrate the frequency response and working principles of various types of oscillators.
CO3	Examine the characteristics and performance of different types of power amplifiers.
CO4	Analyze the working of functional circuits using diodes; BJTs and MOSFETs based on given specifications.
CO5	Evaluate the performance of rectifier and voltage regulator circuits.

Part- A List of Activities for Analog Circuits Lab

S. No.	Activity Title
1	Identify the output waveforms of diode clipper and diode clamper circuits.
2	Construct a half wave rectifier with filter circuit and observe the output voltage.
3	Evaluate the performance of a full-wave rectifier with filter circuit by analyzing the output voltage.
4	To analyze the operation of a Zener diode as a voltage regulator.
5	Explain the working principle of a BJT amplifier in Common Emitter (CE) configuration.
6	Describe the V–I characteristics of FET/MOSFET and explain their operating regions.
7	Apply the concept of transistor biasing to construct an Emitter Follower circuit.
8	Calculate and determine the frequency of an RC Phase Shift Oscillator and demonstrate the output waveform.
9	Analyze the frequency and examine the output waveform characteristics of the Wien Bridge Oscillator.
10	Examine the frequency and output waveform characteristics of the Hartley Oscillator.
11	Define the procedure to measure the frequency and observe the output waveform of a Colpitts oscillator.
12	Inspect the output waveform characteristics of a Class-A Power Amplifier.
13	Evaluate the output waveform characteristics of a Class-B Power Amplifier.
14	Assess the output waveform of a Class-C Power Amplifier.
15	Examine the output waveform of a Class-AB power amplifier.

Part-B: Lab Projects

Every individual student is required design and build one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. BJT audio amplifier/power amplifier
2. Clap Switch Circuit
3. Automatic Night Lamp
4. Simple Function Generator
5. Temperature Controlled Fan
6. MOSFET Based Inverter
7. Racing Car
8. Any project based on IoT/Arduino platform

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-412	Analog & Digital Communication Lab	PCC	1	0	0	2	30	20	50

Pre-requisite: Basic knowledge of Electronics Systems

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Explain the characteristics and output waveforms of AM, FM, PM.
CO2	Compare noise in AM and FM systems.
CO3	Investigate the output responses of PAM, PCM.
CO4	Examine the output responses of PSK, FSK, MSK.
CO5	Verify the response of Digital coding techniques.

Part- A List of Activities for Analog & Digital Communication Lab

S. No.	Activity Title
1	To study the Characteristics/output waveform of Amplitude Modulation and demodulation techniques.
2	To study the Characteristics/output waveform of Frequency Modulation and demodulation techniques.
3	To study the Characteristics/output waveform of Phase Modulation and demodulation techniques.
4	To Investigate and compare the outputs of SSB, DSB-SC and VSB Modulation systems.
5	To study and compare Noise interference in AM and FM Systems.
6	To study the effect of Sampling and Investigate the Output response of Pulse Amplitude Modulation.
7	To Investigate the Output response of Pulse Code Modulation.
8	To Study the output response of ASK, PSK & FSK.
9	To Study Delta modulation and demodulation technique and observe effect of slope overload.
10	To study the output response of QAM.
11	To study the output response of Minimum Shift keying.
12	Study of Time Division Multiplexing system.
13	Study pulse data coding techniques for various formats.
14	Data decoding techniques for various formats.
15	Digital link simulation; error introduction & error estimation in a digital link using MATLAB (SIMULINK)/ communication simulation packages.

Part-B: Lab Projects

Every individual student is required design one Lab Project under the supervision of course teacher. Topic of the project may be from the following list:

1. Smart Agriculture Monitoring System
2. Smart Industrial Automation using Wireless Sensors
3. Home Automation with Robot Assistant
4. Smart Traffic Light Control using Wireless Communication
5. Smart Parking System using IoT Communication
6. IoT-Based Fire Detection & Alert Robot
7. Remote Health Monitoring System
8. Industrial Fault Monitoring
9. Disaster Alert System

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-413	Embedded System Design Lab	PCC	1	0	0	2	30	20	50

Pre-requisite: Basic knowledge of Digital Electronics

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Explain the architecture &functionalities of different building block of 8085 microprocessor.
CO2	Make use of assembly language programs to show working of different blocks of 8051 microcontroller.
CO3	Apply programming skill of 8051 microcontroller to solve arithmetic and logical operations.
CO4	Experiment with peripherals and external devices through interfacing with 8051 microcontrollers.
CO5	Design and interface various peripherals using Arduino and Raspberry Pi controllers.

Part- A List of Activities for Microprocessor and Microcontroller Lab

S. No.	Activity Title
1	Add two 8-bit numbers stored in registers or internal/External memory locations.
2	Multiply two 8- and 16-bit numbers.
3	Transfer block of data from internal memory locations to external memory locations.
4	Sort block of data in ascending or descending order.
5	Generate 5KHz pulse waveform of 50% duty cycle.
6	Interface ADC and DAC.
7	Interface Matrix Keyboard.
8	Interface LCD Displays.
9	Interface Stepper Motor using 8051.
10	Interfacing of a blinking LED using ardino /Uno board.
11	Interfacing of Traffic Light Controller using ardino /Uno board.
12	Interface DC motor using ardino/Uno board.
13	Interfacing of Temperature & Humidity Display using ardino /Uno board
14	Interfacing of LDR-Based Night Light using ardino /Uno board
15	Interface LCD display using Raspbeery Pi GPIOs.

Part-B: Lab Projects

Every individual student is required design and build one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. RFID attendance system
2. Home automation
3. Robotic vehicle
4. Sensor traffic lights
5. Floor cleaning robot
6. Robot for defense applications
7. GPS vehicle tracking
8. Accident identification and SMS

Projects Using Ardino and Resberry Pi

1. IOT sound and Air pollution monitoring
2. Respberry pi Weather report monitoring
3. Smart Dustbin with IOT notifications
4. IOT car parking sensors

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1HSU-401	Universal Human Values	HSS	3	3	0	0	40	60	100

Pre-requisite: Basic Knowledge of Human Values

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Explain the need and process of value education in understanding basic human aspirations for happiness and harmony.
CO2	Apply the understanding of harmony between the self('I') and body to promote health and prosperity.
CO3	Make use of human values such as trust, respect and justice to build harmony in family and society.
CO4	Differentiate the interconnectedness and mutual harmony among different orders of nature to understand co-existence in the whole existence.
CO5	Justify the role of human values and holistic understanding in promoting professional ethics and socially responsible practices.

Detailed Syllabus

Unit 1: Course Introduction – Need, Basic Guidelines, Content and Process for Value Education: Self-Exploration–what is it? 'Natural Acceptance' and Experiential Validation- as the process for self-exploration; Happiness and Prosperity- A look at basic Human Aspirations; Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority; Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario; Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co- existence) rather than as arbitrariness in choice based on liking-disliking. **(6 Hrs.)**

Unit 2: Understanding Harmony in the Human Being - Harmony in Myself: Understanding human being as a co-existence of the sentient 'I' and the material 'Body'; Understanding the needs of Self ('I') and 'Body' - happiness and physical facility; Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer); Understanding the characteristics and activities of 'I' and harmony in 'I' ; Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail; Programs to ensure Sanyam and Health.
Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease. **(5 Hrs.)**

Unit 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship; Understanding the meaning of Trust;

Difference between intention and competence; Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship; Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals; Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives. **(5 Hrs.)**

Unit 4: Understanding Harmony in the Nature and Existence -Whole existence as Coexistence
Understanding the harmony in the Nature; Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature; Understanding Existence as Co-existence of mutually interacting units in all- pervasive space; Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.
Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc. **(4 Hrs.)**

Unit 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics**:** Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco -friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems; Case studies of typical holistic technologies, management models and production systems. the level; Strategy for transition from the present state to Universal Human Order: a. At of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations; Sum up.
Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. to discuss the conduct as an engineer or scientist etc. **(7 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1.	A foundation course in Human Values and Professional Ethics	R. R. Gaur, R. Asthana, G. P. Bagaria	UHV Publications	3rd (2023)
2.	Human Values	A.N. Tripathi	New Age Intl. Publishers, New Delhi	3rd (2023)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1.	Professional Ethics and Human Values (JNTU-Kakinada, Anantpur)	B.S. Raghavan	Scitech Publications	2021
2.	Indian Ethos and Modern Management	B L Bajpai	New Royal Book Co., Lucknow	2004

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1SEU-401	Career Planning Placement-2	Value added	1	0	0	2	50	0	50

Pre-requisite: Basic English communication, grammar, vocabulary, and teamwork skills needed for professional communication and placement preparation.

Course Outcomes:

At the end of the course, students will be able to:	
CO1	Demonstrate improved group communication and workplace interaction skills.
CO2	Apply verbal ability concepts in grammar, vocabulary, and reading tasks relevant to employability.
CO3	Participate effectively in group discussions, case-based conversations, and structured speaking tasks.
CO4	Develop foundational professional documents and workplace communication habits.
CO5	Analyse communication situations and respond with clarity, logic, and confidence.

Detailed Syllabus

Unit 1: Professional Communication in Group Contexts: Transition from academic to professional communication, speaking with purpose, body language in professional settings, listening in teams, collaboration skills, discussion etiquette, communication in formal vs informal contexts. Activity: Icebreaker with role-based speaking, body language observation task. **(6 Hrs.)**

Unit 2: Verbal Ability for Employability: Advanced sentence correction, error detection, commonly confused words, sentence completion, para jumbles basics, contextual vocabulary, reading comprehension with inference and tone-based questions. Activity: Timed verbal drills, RC strategy practice, sentence completion tasks. **(6 Hrs.)**

Unit 3: Group Discussion & Analytical Communication**:** Introduction to group discussion, types of GDs, initiating and concluding a GD, agreeing and disagreeing politely, idea structuring, speaking with relevance, handling interruptions, current-affairs-based discussion approach. Activity: Mock GDs, topic analysis sheet, role rotation in GD. **(6 Hrs.)**

Unit 4: Case Study & Problem-Solving Communication: Introduction to case study approach, identifying problem statement, brainstorming techniques, solution framing, presenting practical recommendations, collaborative problem solving, structured speaking under pressure. Activity: Short case analysis, group solution presentation, business scenario discussion. **(6 Hrs.)**

Unit 5: Resume Basics, Digital Communication & Professional Presence**:** Introduction to resume writing, components of an effective resume, academic achievements and projects presentation, introduction to LinkedIn awareness, email etiquette basics, digital professionalism, online communication manners. Activity: Drafting first resume, email writing practice, profile headline exercise. **(6 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Verbal Ability book	TPP Dept.	TPP	6th
2	Interviews and Group Discussions	T. S. Jain & Gupta	Upkar Publications	2nd (2008)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Word Power Made Easy	Norman Lewis	Goyal Publishers	4th (2012)
2	Communication Skills for Engineers	Sunita Mishra & C.Muralikrishna	Pearson Education	1st (2011)

Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1ECU-414	Future Skills Lab-II	Skill Enhancement	1	0	0	2	30	20	50

Course Outcomes

At the end of the course; the student will be able to	
CO1	Implement digital fabrication tools such as laser cutting machines; CNC routers; and vinyl cutting plotters to manufacture two-dimensional and three-dimensional profiles.
CO2	Design and Integrate mechanical; electronic; and digital fabrication skills to develop a functional prototype or mini-project.
CO3	Apply PLC timer instructions to develop and test a blinking LED circuit and design SCADA screens for controlling simple industrial processes.
CO4	Implement SCADA-based monitoring and control systems using MC Works64 and demonstrate basic robotic operations
CO5	Analyze the performance and safety of collaborative robot operations and PID-controlled systems by evaluating process responses

Part- A List of Activities for Future Skills Lab

S. No.	Activity Title
1	Perform 3D scanning of a physical object; modify the digital model; and prepare it for additive manufacturing.
2	Design a three-dimensional CAD model of a simple component and fabricate it using additive manufacturing techniques.
3	Analyze time-domain and frequency-domain characteristics of signals using a mixed signal oscilloscope.
4	Inspect PCB tracks; solder joints; and electronic components using a digital microscope.
5	Carry out mechanical assembly of a quadcopter platform using a standard assembly kit.
6	Design and fabricate a functional prototype using equipment available in the laboratory.
7	Evaluate the performance of a blinking LED circuit by testing timer instructions in a PLC program to ensure accurate timing and reliable operation.
8	Design a SCADA screen to monitor and display the ON/OFF status of a lamp by organizing appropriate indicators and control elements.
9	Implement a SCADA-based monitoring and control system for industrial processes using MC Works64.
10	Demonstrate basic robotic operations using a robot learning setup by simulating pick-and-place applications.
11	Identify and recognize the basic operations and safety features of a collaborative robot (cobot) for safe human–machine interaction.

12	Apply a PID controller by setting proportional, integral, and derivative parameters to regulate and control a process variable in a basic control system.

Part-B: Lab Projects

Every individual student is required design and build one Lab Project under the supervision of course teacher. Topic of the project may be any from the theory contents and not limited to following list:

1. USB Powered LED Night Lamp
2. Continuity Tester Device
3. Mobile Phone Charger Indicator Board
4. Mini Audio Amplifier Board
5. DC Motor Speed Indicator
6.PLC based auto door control system

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1CSU-401	Discrete Mathematics	PCC	3	3	0	0	40	60	100

Course Outcomes:

At the end of the course, the student will be able to:	
CO1	Identify and apply operations on discrete structures such as sets, relations and functions in different areas of computing.
CO2	Analyze counting techniques to solve real world problems.
CO3	Utilize the concept of graph theory for solving computing problems
CO4	Apply propositional logic concepts to analyze the validity and satisfiability of logical statements.
CO5	Classify the algebraic structures and Boolean algebra by identifying their properties

Detailed Syllabus

Unit 1: Sets, Relation and Function: Introduction, Types, Operations and Laws of Sets, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Functions and its types, Sum and Product of Functions, Bijective functions, Inverse and Composite Function. **(12Hrs.)**

Unit 2: Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination, Recurrence relations, Generating Function, Application. **(10Hrs.)**

Unit 3: Graphs and Trees:Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, and Planar Graphs, definition properties and Example, Biconnected component and Articulation Points, Shortest distances, rooted trees, trees and sorting, weighted trees and prefix codes, Spanning tree.**(10Hrs.)**

Unit 4: Propositional Logic: Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. **(8Hrs.)**

Unit 5: Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Cyclic Groups, Permutation Groups, Subgroup, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form. **(12Hrs.)**

Recent Trends in Discrete Mathematics

Graph Theory and Network Analysis,Applications in Cryptography,Recursion in Programming.

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Discrete Mathematics and its Applications	Kenneth H. Rosen	Tata McGraw – Hill	8th(2022)
2	Discrete Mathematics with Applications	Susanna S. Epp	Wadsworth Publishing Co. Inc.	4th(2021)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Discrete Mathematical Structure and Its Application to Computer Science	J.P. Tremblay and R. Manohar	Tata Mcgraw-Hill	1st(2020)
2	Discrete Mathematics	Norman L. Biggs	Oxford University Press. Schaum's Outlines Series, Seymour Lipschutz, Marc Lipson	2nd(2021)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1CSU-402	**Operating System**	**PCC**	**3**	**3**	**0**	**0**	**40**	**60**	**100**

Course Outcomes:

At the end of the course, the student will be able to:	
CO1	Summarize the concept , architecture and design of operating system.
CO2	Implement the various scheduling algorithms of processes such as fcfs, sjf, round robin, and priority scheduling.
CO3	Explain about process synchronization, deadlock handling methods and security challenges.
CO4	Apply memory management techniques, virtual memory and page replacement algorithms.
CO5	Examine and implement file systems and secondary storage management and scheduling.

Detailed Syllabus

Unit 1: Introduction**:** Characteristics of Modern Operating system. Operating system functions, batch, multi-programmed, time-sharing, real-time, Distributed OS, Embedded system. Parts of OS: Kernel and Shell. **(6 Hrs.)**

Unit 2: Processes and Scheduling*:* Concept of processes, process states type of Schedulers, Process Scheduling and algorithms, scheduling criteria. **(8 Hrs.)**

Unit 3: Process Synchronization and OS Security: Concurrent Processes, Critical section problem, Semaphores, Bounded- Buffer Problem, Readers-writers Problem. Deadlocks: Characterization, Prevention, Avoidance, Detection and Recovery, Combined approach to Deadlock Handling, OS Security Threats and Protection Mechanisms. **(10Hrs.)**

Unit 4: Memory Management*:* Need of Memory management, Introduction to Persistent memory, Characteristics of contiguous and non-contiguous allocation techniques, Paging, segmentation, concept of fragmentation, Virtual memory management, Introduction to page replacement, page-replacement techniques, Thrashing**.** **6 Hrs.)**

Unit 5: File Systems & disk storage: Files: file and directory structure, types of files, access methods, allocation methods (contiguous, linked, and indexed), free-space management (bit vector, linked list, grouping), Distributed File Systems (HDFS, Google File System) Disk Structure, Disk Scheduling, Disk Management, Storage Optimization. **(6 Hrs.)**

Recent Trends in Operating system

AI-enabled Operating Systems, Distributed Operating Systems, Security and Energy Efficient OS.

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1.	Operating System Concepts	Abraham (Avi) Silberschatz, Peter B. Galvin, Greg Gagne	Wiley.	10th(2018)
2.	Modern Operating Systems	Andrew S. Tanenbaum & Herbert Bos	Pearson	5th(2022)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1.	Operating Systems: Internals and Design Principles	William Stallings	Pearson / Prentice Hall	9th(2025)
2.	Modern Operating Systems	Tanenbaum & Bos	Pearson	5th(2024)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1CSU-411	Operating System Lab	PCC	1	0	0	2	30	20	50

Course Outcomes

At the end of the course, the student will be able to:	
CO1	Demonstrate basic services and functionalities of the operating system.
CO2	Construct CPU scheduling programs such as FCFS, Round Robin, SJF, and Priority.
CO3	Apply operating system commands to manage files and directories.
CO4	Develop shell programs using fundamental shell scripting concepts.
CO5	Design solutions for handling deadlocks and apply different file organization techniques.

List of Activities for Operating Systems Lab

S. No.	Activity Title
1.	Write a program to demonstrate the installation steps of Windows/Linux Operating System.
2.	Implementation and calculation of waiting time and turnaround time using CPU-Scheduling First Come First Serve (FCFS), Shortest Job First (SJF) and Round Robin (Pre-emptive) scheduling.
3.	Write a program to implement Priority Scheduling algorithm (pre-emptive and non-pre-emptive).
4.	Write a program to implement the Producer–Consumer problem using semaphores.
5.	Write a program to implement the Dining Philosophers problem.
6.	Perform installation of Virtual Machine software (VMware/Virtual Box) and study the concept of virtualization.
7.	Create a Virtual Machine using a hypervisor and configure system resources.
8.	Install Linux/Windows operating system on a Virtual Machine and test resource allocation.
9.	Implement Linux directory commands such as cd, ls, cp, mv, rm, mkdir, rmdir, and create/view files using cat.
10.	Write a shell script using basic Linux commands.
11.	Write a program to demonstrate parent–child process creation using the fork() system call.
12.	Perform file handling operations and comparison using commands such as cmp, touch, file, sort, cut, and disk space checking commands.

13.	Demonstrate process creation and monitoring in Linux using commands such as ps, who, sleep, kill, background processing, and process priority.
14.	Implement Linux utilities for pipes and process communication using commands such as grep, egrep, find, cal, banner, and demonstrate printing and filtering outputs.
15.	Write bash scripts using shell programming concepts including conditional statements, loops, case statements, shell variables, parameters, and arguments.
16.	Write a program to implement Banker's Algorithm for deadlock avoidance.
17.	Write a program to implement contiguous memory allocation techniques such as First Fit, Best Fit, and Worst Fit.
18.	Write a program to implement Page Replacement algorithms such as (i) First In First Out (FIFO) (ii) Least Recently Used (LRU) (iii) Optimal.

Mini Projects

1.	Develop a REST API that accepts process details and simulates CPU scheduling algorithms such as FCFS, SJF, Round Robin, and Priority, returning waiting time and turnaround time results.
2.	Design a cloud computing environment in CloudSim to analyze virtual machine allocation and resource utilization under different workload conditions.

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1CSU-403	Computer Organization & Architecture	ESC	3	3	0	0	40	60	100

Course Outcomes

At the end of the course, the student will be able to:	
CO1	Explain the functional units and internal architecture of a microprocessor.
CO2	Illustrate the data representation and perform the arithmetic and logical operations on binary data.
CO3	Categorize the design approaches of control unit and I/O data transfer approaches
CO4	Analyze the composition and working of pipelined and parallel processors.
CO5	Explain the functions and role of memory systems in processors.

Detailed Syllabus

Unit 1: Basics of computer architecture**:** Introduction to basic architecture and pin diagram of microprocessor 8085 and their description, instruction format, execution cycle, RTL interpretation of instructions, Instruction set, addressing modes, and basic programming in assembly language. **(9 Hrs.)**

Unit 2: Data representation & Computer Arithmetic: Signed number representation, fixed- and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, multiplication – shift-and add, Booth multiplier etc. Division - restoring and non-restoring techniques. **(7 Hrs.)**

Unit 3: Control Unit Design and I/O Organization**:** CPU control unit design: Hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU. Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged Instructions, software interrupts and exceptions. Programs and processes –role of interrupts in process state transitions, I/O device interfaces – SCII, USB. **(9 Hrs.)**

Unit 4: Introduction to Pipelining and Parallel Processors: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and Cache coherency. **(7 Hrs.)**

Unit 5: Memory Organization: Memory system design: semiconductor memory technologies, memory organization, Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies. **(7 Hrs.)**

Recent Trends in Computing

Introduction to Arduino Uno and Raspberry Pi Boards and basic programming to execute projects like LED blinking, Temperature Monitoringetc.

Text Books

S. No.	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Computer Organization and Architecture	Morris Mano	Pearson Education	3rd(2017)
2	Microprocessor Architecture, Programming and Applications of the 8085	Ramesh S. Gaonkar	Tata McGraw–Hill	5th (2002)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Computer Architecture and Organization	John P. Hayes	WCB/McGraw-Hill	3rd(2002)
2	Computer Organization and Architecture: Designing for Performance	William Stallings	Pearson Education	10th(2019)

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1CSU-412	Computer Organization and Architecture Lab	ESC	1	0	0	2	30	20	50

Course Outcomes:

At the end of the course, the student will be able to:	
CO1	Identify the computer an atomy-Memory, Ports, Motherboardetc.
CO2	Examine the functional units of the microprocessor and various ICs available on its trainer board.
CO3	Analyze the instruction set of a microprocessor 8085 and perform the arithmetic and logical operations on binary data.
CO4	Analyze the instruction set of a microprocessor 8086 and perform the arithmetic and logical operations on binary data.
CO5	Evaluate the operation of microprocessor for I/O based interfacing devices.

List of Activities for Computer Organization and Architecture Lab

S. No.	Activity Title
1	Computer Anatomy- Memory, Ports, Motherboard and add-on cards.
2	Dismantling and assembling PC.
3	Introduction to 8085 kit.
4	Addition of two 8 bit numbers, sum 8 bit.
5	Subtraction of two 8 bit numbers.
6	Find 1's and 2's complement of 8-bit number.
7	Multiplication of 8 bit numbers.
8	Shift an 8-bit no. by one bit.
9	Find Largest among an array of ten numbers.
10	Find smallest among an array of ten numbers (8 bit).
11	Sum of series of 8 bit numbers.
12	Introduction to 8086 kit.
13	Addition and subtraction of two 16 bit numbers, sum 16 bit.
14	Implement of Booth's algorithm for arithmetic operations.
15	Find 1's and 2's complement of 16-bit number.
16	Implement simple programs using I/O based interface.

Mini Projects

1	Introduction to Arduino Uno and various sensors, Monitoring etc.
2	Execution of simple projects like LED blinking, temperature and moisture monitoring etc.

Course Code	Course Title	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1CSU-404	**Design and Analysis of Algorithms**	**PCC**	**3**	**3**	**0**	**0**	**40**	**60**	**100**

Course Outcomes:

At the end of the course, the student will be able to	
CO1	Illustrate algorithm performance using asymptotic complexity and recurrence relations.
CO2	Apply brute-force and divide-and-conquer strategies to solve problems and analyze their efficiency.
CO3	Make use of greedy strategies to solve optimization problems such as Fractional Knapsack, Job Sequencing with Deadlines, and Activity Selection.
CO4	Design dynamic programming approaches for solving complex problems while examining advanced graph optimization algorithms.
CO5	Compare problem classes (P, NP, NP-Complete) along with backtracking, branch & bound, heuristic techniques for solving intractable problems.

Detailed Syllabus

Unit 1: Introduction Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behaviour; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem. **(8 Hrs.)**

Unit 2: Fundamental Algorithmic Strategies: Brute-Force-String Matching, Selection Sort, Sequential Searching. Divide and Conquer: Binary search, Finding the maximum and minimum, Merge sort, Quick sort and its analysis, Strassen's matrix multiplication. **(10 Hrs.)**

Unit 3: Greedy Algorithms- Fractional Knapsack Problem, Job Sequencing with deadlines, Activity Selection Problem, Huffman Coding, Bin packing, Minimum Cost Spanning Tree-Prim's Algorithm, Kruskal's Algorithm, Single source shortest paths- Dijkstra's algorithm. **(10 Hrs.)**

Unit 4: Dynamic Programming- General Method with Examples, Transitive Closure, All Pairs Shortest Paths- Floyd's Warshall Algorithm, Optimal Binary Search Trees, Knapsack problem, Bellman-Ford Algorithm, Travelling Sales Person problem, Network Flow Algorithm. **(10 Hrs.**)

Unit 5: Backtracking- General method, N-Queens problem, Sum of subsets problem, Graph colouring, Hamiltonian cycles. Branch and Bound-Travelling Sales Person problem, 0/1 Knapsack problem, FIFO Branch and Bound solution. Problem Classes: P, NP, NP-Hard and NP-Complete, Randomized algorithm, Approximation algorithm, Heuristic algorithm. **(10Hrs.)**

Recent trends in Design and Analysis of algorithm: Approximation and Randomized Algorithms**,** Streaming and Dynamic Algorithms**,** Machine Learning & AI-Based Algorithms

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein	MIT Press / Pearson.	3rd / 4th Edition(2022)
2	Design and Analysis of Algorithms	Jon Kleinberg, Éva Tardos	Pearson India	2nd Edition (2024)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	The Algorithm Design Manual	Steven S. Skiena	Springer	3rd Edition, (2020)
2	Design and Analysis of Algorithms	Aho, Hopcroft, Ullman	Pearson	1st Edition (2002)

Course Code	Course Name	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1CSU-413	Design and Analysis of Algorithm Lab	PCC	2	0	0	4	30	20	50

Course Outcomes:

At the end of the course, the student will be able to:	
CO1	Illustrate asymptotic notations and relate master's theorem for recurrence relations.
CO2	Apply greedy and dynamic programming techniques to solve optimization problems.
CO3	Implement dfs and bfs algorithms for graph applications.
CO4	Experiment with shortest path algorithms with different edge weight conditions.
CO5	Apply minimum spanning tree algorithms and analyze their performance for different graph structures.
CO6	Develop efficient algorithmic solutions for complex and np-complete problems.

List of Activities for Design and Analysis of Algorithm Lab

S. No.	Activity Title
1	Write a program to implement recurrence relation using binary search.
2	Write a program to implement quick sort using Master's theorem.
3	Write a program to apply Knap Sack using greedy approach.
4	Write a program to implement Job Sequencing with deadlines using Greedy Approach.
5	Write a program to find an optimal solution to Travelling Salesman Problem using dynamic programming.
6	Write a program to find an optimal solution for optimal binary search tree using dynamic programming.
7	Write a program to find an optimal solution to matrix chain multiplication using dynamic programming.
8.	Write a program to implement N-Queens problem using Backtracking method.
9	Write a program of Subset Sum NP-Complete Problem using Branch and Bound Technique.
10	Write a program to find a path from the source to the goal in a maze using DFS.
11	Write a program to find the topological sort of a directed acyclic graph using DFS.
12	Write a program to find connected components of an undirected graph using BFS.
13	Write a program to check whether a given graph is bipartite using BFS.
14	Write a program to find shortest paths in a graph with positive edge weights using Dijkstra's algorithm.

15	Write a program to find shortest paths in a graph with arbitrary edge weights using Bellman-Ford algorithm.
16	Write a program to find shortest paths in a graph with arbitrary edge weights using Floyds' algorithm.
17	Write a program to find the minimum spanning tree in a weighted, undirected graph using Prims' algorithm.
18	Write a program to find the minimum spanning tree in a weighted, undirected graph using Kruskals' algorithm.
19	Write a program to implement Network Flow using Ford-Fulkerson Algorithm.
20	Write a program to match the string using the Rabin-Karp method.
21	Write a program for real-world problem or TSP algorithm using any heuristic technique.
22	Write a program to implement Vertex Cover using Approximation Algorithm.
23	Write a program to implement Randomized Quick Sort Algorithm.

Projects Based

1.	Write a program to build a route optimization system for a map or network. Given a network of cities or nodes, the system finds shortest paths, alternative routes, and connectivity between locations.
2.	Write a program to design an optimal communication or transportation network. This constructs minimum cost networks and determines efficient routes for visiting multiple nodes.

Course Code	Course Name	Category	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1HS U-401	Universal Human Values	HSS	3	3	0	0	40	60	100

Course Outcomes:

At the end of the course, the student will be able to:	
CO1	Explain the need and process of value education in understanding basic human aspirations for happiness and harmony.
CO2	Apply the understanding of harmony between the self ('I') and body to promote health and prosperity.
CO3	Make use of human values such as trust, respect and justice to build harmony in family and society.
CO4	Differentiate the interconnectedness and mutual harmony among different orders of nature to understand co-existence in the whole existence.
CO5	Justify the role of human values and holistic understanding in promoting professional ethics and socially responsible practices.

Detailed Syllabus

Unit 1: Course Introduction – Need, Basic Guidelines, Content and Process for Value Education**:** Self-Exploration–what is it? 'Natural Acceptance' and Experiential Validation- as the process for self-exploration; Happiness and Prosperity- A look at basic Human Aspirations; Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority; Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario; Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co- existence) rather than as arbitrariness in choice based on liking-disliking. **(6 Hrs.)**

Unit 2: Understanding Harmony in the Human Being - Harmony in Myself**!:** Understanding human being as a co-existence of the sentient 'I' and the material 'Body'; Understanding the needs of Self ('I') and 'Body' - happiness and physical facility; Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer); Understanding the characteristics and activities of 'I' and harmony in 'I' ; Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail; Programs to ensure Sanyam and Health.
Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease. **(5 Hrs.)**

Unit 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship; Understanding the meaning of Trust; Difference between intention and competence; Understanding the meaning of Respect,

Difference between respect and differentiation; the other salient values in relationship; Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals; Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' live.

(5 Hrs.)

Unit 4: Understanding Harmony in the Nature and Existence -Whole existence as Coexistence: Understanding the harmony in the Nature; Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature; Understanding Existence as Co-existence of mutually interacting units in all- pervasive space; Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc. **(4 Hrs.)**

Unit 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order ; Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco - friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems; Case studies of typical holistic technologies, management models and production systems. The level; Strategy for transition from the present state to Universal Human Order: a. At of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations; Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. to discuss the conduct as an engineer or scientist etc. **(7 Hrs.)**

Text Books

S. No	Name of the Book	Author	Publisher	Edition (Publication Year)
1.	A foundation course in Human Values and Professional Ethics	R. R. Gaur, R. Asthana, G. P. Bagaria	UHV Publications	3rd (2023)
2.	Human Values	A.N. Tripathi	New Age Intl. Publishers, New Delhi	3rd (2023)

Reference Books

S.No	Name of the Book	Author(s)	Publisher	Edition (Publication Year)
1.	Professional Ethics and Human Values (JNTU-Kakinada, Anantpur)	B.S. Raghavan	Scitech Publications	2nd (2021)
2.	Indian Ethos and Modern Management	B L Bajpai	New Royal Book Co., Lucknow	3rd (2004)

Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Internal Marks	External Marks	Total
25C1SEU -401	**Career and Placement Planning -2**	**Value Added**	**1**	**0**	**0**	**2**	**50**	**0**	**50**

Pre-requisite: Basic English communication, grammar, vocabulary, and teamwork skills needed for professional communication and placement preparation.

Course Outcomes

At the end of the course, students will be able to:	
CO1	Demonstrate improved group communication and workplace interaction skills.
CO2	Apply verbal ability concepts in grammar, vocabulary, and reading tasks relevant to employability.
CO3	Participate effectively in group discussions, case-based conversations, and structured speaking tasks.
CO4	Develop foundational professional documents and workplace communication habits.
CO5	Analyse communication situations and respond with clarity, logic, and confidence.

Detailed Syllabus

Unit 1: Professional Communication in Group Contexts: Transition from academic to professional communication, speaking with purpose, body language in professional settings, listening in teams, collaboration skills, discussion etiquette, communication in formal vs informal contexts. Activity: Icebreaker with role-based speaking, body language observation task. **(6 Hrs.)**

Unit 2: Verbal Ability for Employability: Advanced sentence correction, error detection, commonly confused words, sentence completion, para jumbles basics, contextual vocabulary, reading comprehension with inference and tone-based questions. Activity: Timed verbal drills, RC strategy practice, sentence completion tasks. **(6 Hrs.)**

Unit 3: Group Discussion & Analytical Communication: Introduction to group discussion, types of GDs, initiating and concluding a GD, agreeing and disagreeing politely, idea structuring, speaking with relevance, handling interruptions, current-affairs-based discussion approach. Activity: Mock GDs, topic analysis sheet, role rotation in GD. **(6 Hrs.)**

Unit 4: Case Study & Problem-Solving Communication: Introduction to case study approach, identifying problem statement, brainstorming techniques, solution framing, presenting practical recommendations, collaborative problem solving, structured speaking under pressure. Activity: Short case analysis, group solution presentation, business scenario discussion. **(6 Hrs.)**

Unit 5: Resume Basics, Digital Communication & Professional Presence: Introduction to resume writing, components of an effective resume, academic achievements and projects presentation, introduction to LinkedIn awareness, email etiquette basics, digital professionalism, online communication manners. Activity**:** Drafting first resume, email writing practice, profile headline exercise. **(6 Hrs.)**

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Verbal Ability book	TPP Dept.	TPP	6th
2	Interviews and Group Discussions	T. S. Jain & Gupta	Upkar Publications	2nd(2008)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Publication Year)
1	Word Power Made Easy	Norman Lewis	Goyal Publishers	4th (2012)
2	Communication Skills for Engineers	Sunita Mishra &C.Muralikrishna	Pearson Education	1st(2011)