



TECHNO INDIA UNIVERSITY

W E S T B E N G A L

Syllabus

for

4-Years B.Tech.

in

**Computer Science and Engineering
(Specialization in Artificial Intelligence)**

Academic Year: 2024-2025

Semester 2

CAREER ADVANCEMENT & SKILL DEVELOPMENT-II - COMMUNICATION SKILL (TIU-HSM-UEN-S12191)

Program: B.Tech in CSE-AI	Year, Semester: 1st Year, 2nd Sem
Course Title: CAREER ADVANCEMENT & SKILL DEVELOPMENT-II - COMMUNICATION SKILL	Subject Code: TIU-HSM-UEN-S12191
Contact Hours/Week: 0-0-2 (L-T-P)	Credit: 1

COURSE OBJECTIVE:

Enable the student to:

1. Develop fluency in spoken and written English for clear, precise, and confident communication.
2. Train in formal writing, reports, proposals, and multimedia presentations.
3. Strengthen people skills, time management, and analytical reading for workplace success.

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	Explain fundamental communication principles and assess their relevance in workplace interactions.	K2
CO-2:	Apply grammar and language skills to construct precise and coherent spoken and written communication	K3
CO-3:	Demonstrate fluency in spoken English through practicing pronunciation drills, developing vocabulary, and engaging in interactive conversations.	K4
CO-4:	Construct well-organized sentences and paragraphs to enhance professional writing.	K3
CO-5:	Develop and revise written communication by employing strategies for drafting, editing, and proofreading	K3
CO-6:	Assess and refine communication skills to ensure clarity, precision, and confidence in workplace interactions.	K4

COURSE CONTENT:

MODULE 1:	COMMUNICATION THEORY AND WORKPLACE DYNAMICS	7 Hours
Definition of Communication, Communication Models, Workplace Communication Strategies, Effective Messaging, Organizational Communication, Cultural Communication, Verbal and Non-Verbal Cues, Barriers to Communication, Interpersonal and Group Communication		

MODULE 2:	ADVANCED LANGUAGE AND GRAMMAR PROFICIENCY	5 Hours
Morphology and Syntax, Sentence Structuring, Advanced Grammar Rules, Tense Modulation, Phrasal Verbs, Modifiers, Cohesion and Coherence, Lexical Resource, Semantics, Formal vs. Informal Register		
MODULE 3:	STRATEGIC SPEAKING AND ORAL PROFICIENCY	8 Hours
Phonetics and Phonology, Pronunciation Refinement, Stress and Intonation, Articulation and Clarity, Persuasive Speaking, Argumentation and Debate, Spontaneous Speaking, Interview Techniques, Business Pitches, Active Listening Strategies		
MODULE 4:	PROFESSIONAL AND TECHNICAL WRITING	8 Hours
Writing Process Methodologies, Text Structuring, Precision in Writing, Report Writing, Business Proposals, Formal Correspondence, Executive Summaries, Editing and Proofreading, Technical Documentation, Press Releases, Persuasive and Analytical Writing		
MODULE 5:	APPLIED LANGUAGE AND COMMUNICATION EXERCISES	5 Hours
Lexical Expansion, Idiomatic Expressions, Context-Based Learning, Grammar in Context, Role-Plays and Simulations, Speech Analysis, Storytelling Techniques, Collaborative Writing, Dialogues, Workplace Case Studies		
MODULE 6:	CORPORATE COMMUNICATION AND LEADERSHIP SKILLS	4 Hours
Professional Etiquette, Negotiation Tactics, Conflict Resolution, Crisis Communication, Leadership and Persuasion, Presentation Design, Cross-Cultural Communication, Media and Public Relations, Digital Communication Ethics, High-Stakes Conversations		
TOTAL LECTURES		30 Hours

Books:

1. Sanjay Kumar, Pushp Lata, "Communication Skills", Oxford University Press, 2015, ISBN: 9780199457069
2. M Ashraf Rizvi, "Effective Technical Communication", McGraw Hill Education, 2017, ISBN 9352606108
3. Sarah Trenholm and Arthur Jensen, "Interpersonal Communication", Oxford University Press, 2017, ISBN-10: 019064625X, ISBN-13: 978-0190646257
4. Claude G. Théoret, "Advanced Communication Skills: 7 Keys to Personal and Professional Growth", Independently Published, 2020, ISBN-10: 1656945618, ISBN-13: 978-1656945615..
5. Ronald B. Adler, Lawrence B. Rosenfeld, and Russell F. Proctor II, "Interplay: The Process of Interpersonal Communication", Oxford University Press, 2017, ISBN-10: 019064625X, ISBN-13: 978-0190646257.
6. Joseph A. DeVito, "The Interpersonal Communication Book", Pearson, 2015, ISBN-10: 0133753816, ISBN-13: 978-0133753813.
7. Mark L. Knapp and John A. Daly, "The SAGE Handbook of Interpersonal Communication", SAGE Publications, 2011, ISBN-10: 1412974747, ISBN-13: 978-1412974745.3.

8. John Stewart, "Bridges Not Walls: A Book About Interpersonal Communication", McGraw-Hill Education, 2011, ISBN-10: 0073534315, ISBN-13: 978-0073534312.
9. Pamela J. Kalbfleisch, "Interpersonal Communication: Evolving Interpersonal Relationships", Routledge, 2013, ISBN-10: 0805816611, ISBN-13: 978-0805816619.
10. Deborah Tannen, "Talking from 9 to 5: Women and Men at Work", William Morrow Paperbacks, 2001, ISBN-10: 0060959622, ISBN-13: 978-0060959623.

Mathematics-IIA (TIU-BS-UMA-T12101A)

Program: B. Tech. in CSE-AI	Year, Semester: 1st Yr., 2nd Sem.
Course Title: Mathematics-II	Subject Code: TIU-BS-UMA-T12101A
Contact Hours/Week: 3-1-0 (L-T-P)	Credit: 4

COURSE OBJECTIVE:

Enable the student to:

1. understand the basics of complex analysis.
2. understand algebraic and geometric representations of vectors and vector spaces and various operations on vector spaces.
3. solve differential equations with series solution method
4. learn the applications of the definite and indefinite integrals.

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	analyze complex functions based on analyticity, integrability along a contour, calculus of residue, etc. and its applications in engineering.	K4
CO-2:	develop an understanding of vector spaces and inner product spaces.	K4
CO-3:	identify linear transformations on vector spaces and to determine the corresponding matrix representation.	K4
CO-4:	determine the solution of ordinary differential equations using a series solution method.	K4
CO-5:	formulate some special functions, namely, Legendre and Bessel functions.	K4
CO-6:	develop an understanding of Integral calculus and its applications such as determining the area between two curves, the surface of revolution etc.	K4

COURSE CONTENT:

MODULE 1:	Complex analysis	10 Hours
Complex analysis: Limit, continuity, differentiability and analyticity of functions, Cauchy-Riemann equations, line integrals, Cauchy Goursat theorem (statement only), independence of path, Complex integration over a contour, Cauchy's integral formula, derivatives of analytic functions, Taylor's series, Laurent's series, Zeros and singularities, Residue theorem, evaluation of real integrals by contour integration.		
MODULE 2:	Linear algebra	10 Hours

Linear Algebra: Vector spaces over any arbitrary field, linear combination, linear dependence and independence, basis and dimension, linear transformations, matrix representation of linear transformations, linear functional, dual spaces, Inner product spaces, norms, Gram-Schmidt process, orthonormal bases, projections and least squares approximation.		
MODULE 3:	Series solution of ODE	10 Hours
Series solution of ODE: Review of power series, Ordinary point, regular and irregular singular point, series solution near ordinary and regular singular point. Legendre's equation and Legendre polynomials, Bessel's equation and Bessel's functions.		
MODULE 4:	Integral calculus	8 Hours
Riemann Integral, fundamental theorem of integral calculus, applications of definite integrals, improper integrals, Beta and Gamma functions, reduction formulae. Double and triple integration, change in order of integration, Jacobian and change of variables formula. Parametrization of curves and surfaces.		
MODULE 5:	Vector calculus	7 Hours
Vector fields, divergence and curl, Line integrals, Green's theorem, surface integral, Gauss and Stokes' theorems with applications.		
TOTAL LECTURES		45 Hours

Books:

1. Higher Engineering Mathematics, *B. S. Grewal*
2. Advanced Engineering Mathematics, *Kreyszig*
3. A Text Book of Engineering Mathematics, *Rajesh Pandey*
4. Engineering Mathematics, *B. K. Pal, K. Das*

Mathematics for Data Science (TIU-BS-UMA-T12102)

Program: B.Tech CSE-AI	Year, Semester: 1 st Yr. 2 nd Sem.
Course Title: Mathematics for Data Science	Subject Code: TIU-BS-UMA-T12102
Contact Hours/Week: 3-0-0 (L-T-P)	Credit: 3

COURSE OBJECTIVE:

Enable the student to:

1. understand algebraic and geometric representations of vectors and vector spaces and various operations on vector spaces and inner product space.

2. learn the basics of probability and apply them to real time problems.
3. understand basic statistics, dispersion, regression and curve fitting technique

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	develop an understanding of vector spaces and inner product spaces.	K4
CO-2:	identify linear transformations on vector spaces and to determine the corresponding matrix representation.	K4
CO-3:	calculate the probability using basic knowledge and fundamental concepts of probability.	K4
CO-4:	illustrate conditional probability, Bayes' Theorem and understand their scope of application to real world problems	K4
CO-5:	To investigate data-based on measures of central tendency, measures of dispersion	K4
CO-6:	To analyze observations in terms of regression and curve fitting	K4

COURSE CONTENT:

MODULE 1:	Linear algebra	20 Hours
Linear Algebra: Vector spaces over any arbitrary field, linear combination, linear dependence and independence, basis and dimension, linear transformations, matrix representation of linear transformations, linear functional, dual spaces, Inner product spaces, norms, Gram-Schmidt process, orthonormal bases, projections and least squares approximation.		
MODULE 2:	Basic Probability	10 Hours
Classical, relative frequency and axiomatic definitions of probability, mutually exclusive events, independent events, conditional probability, Bayes' Theorem.		
MODULE 3:	Integral calculus	15Hours
Raw data, Histogram, Frequency polygon. Measures of central tendencies – Arithmetic mean, Geometric mean, Harmonic mean, Weighted A.M., G.M. and H.M.; Mode, Median, Empirical relation between mean, median and mode; Mean, median and mode for grouped and ungrouped data. Measures of dispersion- standard deviation and variance for grouped and ungrouped data. Correlation and Regression – Covariance, Spearman's coefficient of correlation for grouped and ungrouped data; regression and least square curve fitting		
TOTAL HOURS:		45 Hours

Textbooks:

1. Higher Engineering Mathematics, B. S. Grewal

2. Advanced Engineering Mathematics, E. Kreyszig
3. Linear Algebra, S. H. Friedberg, A. J. Insel, L. E. Spence
4. Engineering Mathematics, B. K. Pal, K. Das

Engineering Mechanics (TIU-ES-UME-T12101)

Program: B. Tech. in CSE-AI	Year, Semester: 1st Yr., 2nd Sem.
Course Title: Engineering Mechanics	Subject Code: TIU-ES-UME-T12101
Contact Hours/Week: 3-0-0 (L-T-P)	Credit: 3

COURSE OBJECTIVE :

Enable the student to:

1. understand the basics of vector mechanics and its applications in engineering mechanics
2. analyze problems in statics
3. analyze problems in dynamics of particles

COURSE OUTCOME :

On completion of the course, the student will be able to:

CO-1:	To understand the basics of vector mechanics and its application in engineering mechanics.	K2
CO-2:	To understand different force systems and the methods of finding their resultants and to be well-versed with the conditions of equilibrium in 2D.	K2
CO-3:	To be able to apply the laws of static equilibrium in solving problems and perform analysis of statically determinate trusses.	K4
CO-4:	To be able to compute centroids of plane areas, composite areas and to be able to compute area moments of inertias and radii of gyration of plane figures.	K3
CO-5:	To understand basic principles of kinematics of particles, plane, rectilinear and curvilinear coordinate systems and projectile motion	K3
CO-6:	To understand basic principles of kinetics of particles leading to Newton's laws and to be able to apply the work-energy and the linear impulse-linear momentum theorems in solving typical problems	K3

COURSE CONTENT :

MODULE 1:	INTRODUCTION	4 Hours
Introduction: Fundamentals of Mechanics: Introduction to mechanics; Basic concepts – mass, space, time and force; Particles and rigid bodies; Scalars and vectors; Free, sliding, fixed and unit vectors; Addition, subtraction and multiplication of two vectors; scalar triple product and vector product of 3 vectors.		
MODULE 2:	FORCE SYSTEMS AND EQUILIBRIUM	9 Hours
Force systems: Introduction to different force systems; Composition of forces – triangle, parallelogram and polygon law of forces, and addition of two parallel forces; Resolution of forces; Moment of a force, Varignon's theorem; Couples; Force-couple system; Resultant of a force		

system Equilibrium: Force Systems & Equilibrium: Free body diagram, equilibrium conditions in 2 dimensions, equilibrium of systems involving friction.		
MODULE 3:	STRUCTURES	5 Hours
Plane Truss: Statically determinate trusses; Force analysis of a truss - method of joints, method of sections		
MODULE 4:	DISTRIBUTED FORCES	7 Hours
Distributed Forces: Line, area and volume distributions of forces; Centre of gravity; Centre of mass; Centroids of plane figures; Centroids of composite areas. Moment of Inertia: Area moment of inertia; Perpendicular and Parallel axes theorems pertaining to moment of inertia; Radius of gyration.		
MODULE 5:	KINEMATICS OF PARTICLES	8 Hours
Kinematics of Particles: Differential equations of kinematics – plane, rectilinear and curvilinear motions; Cartesian co-ordinate system; Normal and tangent co-ordinate system, projectile motion.		
MODULE 6:	KINETICS OF PARTICLES	12 Hours
Kinetics of Particles: Newton’s second law of motion; Work and energy principle – gravitational potential energy, elastic potential energy, kinetic energy, power, work-energy theorem, principle of impulse and momentum.		
TOTAL LECTURES		45 Hours

Books:

1. J. L. Meriam and L. G. Kraige, Engineering Mechanics (Vol.1 & 2), Wiley India 2017.
2. Shames I. H., Rao G. K. M., Engineering Mechanics, Pearson, 2005.
3. Khurmi R.S. ,A Textbook of Engineering Mechanics, S. Chand, 2018.
4. Bhavikatti S. S, Engineering Mechanics, New Age International Publishers, 2021.

Problem Solving Using Data Structures (TIU-ES-UCS-T12101)

Program: B. Tech. in CSE-AI	Year, Semester: 1st Yr., 2nd Sem
Course Title: Problem Solving Using Data Structures	Subject Code: TIU-ES-UCS-T12101
Contact Hours/Week: 3-0-0 (L-T-P)	Credit: Theory-3

COURSE OBJECTIVES:

1. Introduce fundamental data structures such as arrays, linked lists, stacks, queues, and trees, and their role in computational problem-solving.
2. Develop logical and analytical thinking by applying data structures to efficiently store, process, and manipulate data in various programming scenarios.
3. Enhance problem-solving abilities by selecting appropriate data structures based on efficiency, scalability, and real-world applicability.

COURSE OUTCOMES:

On completion of the course, the student will be able to:

CO-1	Recall and describe fundamental data structures, including arrays, linked lists, stacks, queues, and trees.	K1
CO-2	Explain searching and sorting techniques, along with their efficiency on different data structures.	K2
CO-3	Apply array and linked list operations to solve computational problems.	K3
CO-4	Implement stack and queue-based algorithms for expression evaluation and problem-solving scenarios.	K3
CO-5	Examine tree-based data structures (Binary Trees, BSTs) and their traversal techniques for problem-solving.	K4
CO-6	Compare different data structures based on their efficiency, scalability, and real-world applicability.	K4

COURSE CONTENT:

MODULE 1:	BASIC CONCEPTS OF DATA REPRESENTATION	6 Hours
Abstract Data Types, Fundamental and Derived Data Types, Representation, Primitive Data Structures.		
MODULE 2:	ARRAYS	9 Hours
Representation of Arrays, Single and Multidimensional Arrays, Address Calculation Using Column and Row Major Ordering, Various Operations on Arrays, Application of Arrays in Matrix Multiplication, Sparse Polynomial Representation and Addition. Solving different problems using Arrays: Find the missing number in an array, Rotate an array to the right by k steps by reversing the array and its sub-arrays, Move all zeros in the array to the end while maintaining the relative order of non-zero elements using a two-pointer approach.		
MODULE 3	SEARCHING AND SORTING ON VARIOUS DATA STRUCTURES	6 Hours
Sequential Search, Binary Search, Comparison-based sorting concepts, Bubble Sort, Insertion Sort, Selection Sort.		
MODULE 4	STACKS AND QUEUES	9 Hours
Representation of Stacks and Queues using Arrays and Linked List, Circular Queues. Applications of Stacks: Conversion from Infix to Postfix and Prefix Expressions, Evaluation of Postfix Expression Using Stacks. Solving different problems using stack and queue: Validates if parentheses are balanced, Finds the next greater element for each item in a stack, Implements stack operations using two queues, Reverses the elements of a queue, Implements queue operations using two stacks, Implements a circular queue, Implements queue operations using two stacks.		
Module 5	Linked Lists	6 Hours
Single Linked List, Operations on List, Polynomial Representation and Manipulation Using Linked		

Lists, Circular Linked Lists, Doubly Linked Lists. Solving different problems using Linked List: Reverse the order of elements in a singly linked list, Merge two linked lists into one list.		
Module 6	Trees	9 Hours
Binary Tree, Binary Search Tree, Traversal Methods: Preorder, In-Order, Post-Order Traversal (Recursive And Non-Recursive), Representation (Non-threaded and Threaded) of Trees and its Applications.		
TOTAL LECTURE		45 Hours

Books:

1. "Data Structures in C" by Tanenbaum, Moshe J. & Augenstein, PhilipC
2. Gilberg and Forouzan: "Data Structure- A Pseudo code approach with C" by Thomson publication
3. "Fundamental of Data Structure" (Schaums Series) Tata-McGraw-Hill.
4. "Fundamentals of data structure in C" Horowitz, Sahani & Freed, Computer Science Press.
5. "Data Structures Using C" by Reema Thareja

Basic Electrical & Electronics Engineering (TIU-ES-UEE-T12101)

Program: B. Tech. in CSE-AI	Year, Semester: 1st Yr., 2 nd Sem.
Course Title: Basic Electrical & Electronics Engineering	Subject Code: TIU-ES-UEE-T12101
Contact Hours/Week: 3-1-0 (L-T-P)	Credit: 4

COURSE OBJECTIVE :

Enable the student to:

1. Analyze and describe the basic electrical quantities, circuit elements, and their voltage-current relationships.
2. Design and analyze diode circuits, transistor biasing, and operational amplifier applications.
3. Understand the operation and characteristics of semiconductor devices like diodes, BJTs, JFETs, and MOSFETs.
4. Analyzing differential working principles of single-phase transformers, including voltage transformation and regulation.

COURSE OUTCOME:

On completion of the course, the student will be able to:

CO-1:	Understand Basic Electrical Concepts	K2
CO-2:	Analyze DC Electrical Networks	K4
CO-3:	Analyze AC Circuits and Power Systems	K4
CO-4:	Understand Semiconductor Devices and Applications	K2
CO-5:	Design and Analyze Analog Circuits	K3

CO-6:	Understand Transformer Principles and Applications	K2
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COURSE CONTENT:

MODULE 1:	INTRODUCTION	4 Hours
Basic electrical quantities, Voltage, Current, Power. Basic Electrical elements: Resistance, Inductance, Capacitance. Their voltage-current relationship. Voltage and current sources.		
MODULE 2:	DC NETWORK ANALYSIS	6 Hours
KCL and KVL and their applications in purely resistive circuits. Concept of linear, bilateral networks. Source conversion, Star-Delta conversion.		
MODULE 3:	DC NETWORK THEOREMS	5 Hours
Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem.		
MODULE 4:	SINUSOIDAL STEADY STATE ANALYSIS	5 Hours
Matrix and Determinant: Revision of matrix and determinant, rank and nullity, solutions of system of linear equations using Determinants and Matrices; Eigenvalues and eigenvectors, Cayley-Hamilton Theorem, transformation of matrices, adjoint of an operator, normal, unitary, hermitian and skew-hermitian operators, quadratic forms.		
MODULE 5:	3-PH CIRCUITS	5 Hours
Introduction to 3-Ph quantities. 3-ph star and delta connection. Phasor diagram for 3-ph system, Balanced 3-ph loads, measurement of 3-ph power.		
MODULE 6:	SEMICONDUCTOR DEVICES	6 Hours
Energy bands in solids. Intrinsic and extrinsic semiconductors. P-N junctions. Semiconductor diodes: Zener and Varactor diodes. Bipolar transistors (operation, characteristics).		
MODULE 7:		4 Hours
Diode Circuits, BJT biasing & Operation of JFET, MOSFET		
MODULE 8:	OPAMPS	5 Hours
Properties of an ideal and a practical OPAMP. Block diagram. Concept of Virtual Short, Inverting and Non-inverting amplifiers, Summing and Differencing amplifier, Differentiator and Integrator.		
MODULE 9:	1-Ph TRANSFORMERS	5 Hours
Faraday's Law, EMF generation (dynamic and static), B-H curve, Construction and operation of single phase transformer: voltage and current transformation, no-load operation, voltage regulation on resistive load.		
TOTAL LECTURES		45 Hours

Books:

1. D. Chattopadhyay, P. C. Rakshit, Fundamentals of Electric Circuit Theory, S. Chand. Publications

2. D. Chattopadhyay, P.C. Rakshit, Electronics Fundamentals and Applications, New Age International Publisher
3. Salivahanan and P. Kumar, Circuit Theory, Vikas Publishing House
4. Kulshreshtha, Basic Electrical Engineering: Principles and Application, Tata McGraw-Hill.

Problem Solving Using Data Structures Lab (TIU-ES-UCS-L12101)

Program: B. Tech in CSE-AI	Year, Semester: 1 st Yr., 2 nd Sem
Course Title: Problem Solving Using Data Structures Lab	Subject Code: TIU-ES-UCS-L12101
Contact Hours/Week: 0-0-3 (L-T-P)	Credit: Lab.-1.5

Course Objective:

Enable the students to

1. Develop a strong foundation in data structures and algorithms with a focus on both linear and non-linear structures.
2. Implement and analyze searching, sorting, and graph algorithms to optimize problem-solving efficiency.
3. Enhance programming skills by applying data structures in real-world applications and evaluating their complexity.
4. Understand and assess the time and space complexity of algorithms for efficient software development.

Course Outcome:

CO-1	Understand fundamental data structures such as arrays, linked lists, stacks, queues, trees, and graphs along with their applications.	K2
CO-2	Implement various data structures using programming techniques to efficiently store, manipulate, and retrieve data.	K3
CO-3	Analyze and apply different searching and sorting algorithms to optimize problem-solving.	K4
CO-4	Evaluate the time and space complexity of algorithms to improve computational efficiency.	K5
CO-5	Apply data structures and algorithms to solve real-world problems and develop efficient software solutions.	K3
CO-6	Explore advanced data structures and algorithmic techniques for tackling complex computing challenges.	K6

COURSE CONTENT:

MODULE 1:	INTRODUCTION	6 Hours
Basic Concepts of Data Representation: Abstract Data Types, Fundamental and Derived Data Types, Representation, Primitive Data Structures.		

MODULE 2:	ARRAY REPRESENTATION	6 Hours
Arrays: Representation of Arrays, Single and Multidimensional Arrays, Address Calculation Using Column and Row Major Ordering, Various Operations on Arrays, Application of Arrays Matrix Multiplication, Sparse Polynomial Representation and Addition. Solving different problems using Arrays such as the followings: Find the missing number in an array, Rotate an array to the right by k steps by reversing the array and its sub-arrays, Move all zeros in the array to the end while maintaining the relative order of non-zero elements using a two-pointer approach.		
MODULE 3:	SEARCHING AND SORTING TECHNIQUES	6 Hours
Searching and Sorting on Various Data Structures: Sequential Search, Binary Search, Comparison based sorting concept, Bubble sort, Insertion Sort, Selection Sort.		
MODULE 4:	STACK AND QUEUE	9 Hours
Stacks and Queues: Representation of Stacks and Queues using Arrays and Linked List, Circular Queues. Applications of Stacks, Conversion from Infix to Postfix and Prefix Expressions, Evaluation of Postfix Expression Using Stacks. Solving different problems using stack and queue such as Validates if parentheses are balanced, Finds the next greater element for each item in a stack, Implements stack operations using two queues, Reverses the elements of a queue, Implements queue operations using two stacks, Implements a circular queue, Implements queue operations using two stacks.		
MODULE 5:	LINKED LISTS	9 Hours
Linked Lists: Single Linked List, Operations on List, Polynomial Representation and Manipulation Using Linked Lists, Circular Linked Lists, Doubly Linked Lists. Solving different problems using Linked List such as Reverse the order of elements in a singly linked list, Merge two linked lists into one list.		
MODULE 6:	TREE DATA STRUCTURES AND TRAVERSALS	9 Hours
Trees: Binary Tree, Binary Search Tree, Traversal Methods: Preorder, In-Order, Post-Order Traversal (Recursive And Non-Recursive), Representation (Non-threaded and Threaded) of Trees and its Applications.		
TOTAL LAB HOURS		45 Hours

Books:

1. "Data Structures in C" by Tanenbaum, Moshe J. & Augenstein, PhilipC
2. Gilberg and Forouzan: "Data Structure- A Pseudocode approach with C" by Thomson publication
3. "Fundamentals of Data Structure" (Schaum's Series) Tata-McGraw-Hill.
4. "Fundamentals of data structure in C" Horowitz, Sahani & Freed, Computer Science Press.
5. "Data Structures Using C" by Reema Thareja

Basic Electrical Engineering Lab and Simulation (TIU-ES-UEE-L12101)

Program: B. Tech. in CSE-AI	Year, Semester: 1 st Yr., 2nd Sem.
Course Title: Basic Electrical Engineering Lab	Subject Code: TIU-ES-UEE-L12101

and Simulation	
Contact Hours/Week: 0-0-3 (L-T-P)	Credit: 1.5

COURSE OBJECTIVE :

Enable the student to:

1. introduce fundamental electrical and electronic circuit theorems and develop analytical skills for solving electrical networks.
2. familiarize students with essential circuit components, including R-L-C circuits, diodes, rectifiers, and fluorescent lamps, and their practical applications.
3. enhance hands-on laboratory skills by conducting experiments on circuit analysis, diode characteristics, and rectifier efficiency evaluation.

COURSE OUTCOME :

The student will be able to:

CO-1	Identify and understand fundamental electrical and electronic circuit theorems and their applications.	K1
CO-2	Explain the working principles of R-L-C circuits, diodes, rectifiers, and fluorescent lamps.	K2
CO-3	Apply circuit theorems such as Superposition and Thevenin's Theorem to analyze electrical networks.	K3
CO-4	Conduct experiments to measure and analyze V-I characteristics of P-N junction and Zener diodes.	K3
CO-5	Evaluate the efficiency and power factor of electrical circuits, rectifiers, and fluorescent lamps.	K4
CO-6	Compare different rectifier circuits and analyze their output waveforms and ripple factors.	K4

COURSE CONTENT:

Experiment 1	Verification of Superposition Theorem	3 Hours
Theoretical foundation of superposition theorem, Application in linear electrical circuits, Step-by-step circuit analysis with multiple voltage/current sources, Practical applications in circuit design, troubleshooting, and network analysis.		
Experiment 2	Study of R-L-C Series Circuit	3 Hours
Characteristics of resistance (R), inductance (L), and capacitance (C) in AC circuits, Impedance (Z) and phase angle, Voltage and current phase relationships, Leading and lagging power factor, Practical applications in circuit analysis and troubleshooting.		
Experiment 3	Verification of Thevenin's Theorem	3 Hours
Theoretical foundation of Thevenin's theorem, Converting complex circuits into Thevenin equivalent, Measuring Thevenin voltage (Vth) and resistance (Rth), Practical applications in circuit design and network analysis.		

Experiment 4	Characteristics of Fluorescent Lamp	3 Hours
Gas discharge and phosphor coating in light production, Role of starter, choke (ballast), and electrodes, Measuring voltage, current, and power consumption, Efficiency comparison with incandescent and LED lamps, Impact of inductive ballast on power factor and improvement methods, Performance comparison of electromagnetic vs. electronic ballasts, Energy savings, lifespan, and environmental concerns (mercury content).		
Experiment 5	Familiarization with Basic Electronic Components	3 Hours
Identification, specifications, and testing of R, L, and C components (Color codes), Potentiometers, switches (SPDT, DPDT, DIP), Breadboards and Printed Circuit Boards (PCBs), Active components: Diodes, BJTs, JFETs, MOSFETs, Power transistors, SCRs, LEDs.		
Experiment 6	Study of V-I Characteristics of P-N Junction Diode in Forward Bias	3 Hours
Depletion layer and barrier potential, Forward bias operation, Breakdown voltage and Peak Inverse Voltage (PIV), Knee voltage and ideal PN junction diode characteristics.		
Experiment 7	V-I Characteristics of Zener Diode in Reverse Bias	3 Hours
Depletion layer and barrier potential, Reverse bias operation, Breakdown voltage and Peak Inverse Voltage (PIV), Knee voltage and ideal Zener diode characteristics.		
Experiment 8	Study of Half-Wave and Full-Wave Rectifier	3 Hours
Half-wave and full-wave rectifiers (Center-tap and Bridge), Output waveforms and voltage regulation, Ripple factor and rectifier efficiency.		
TOTAL LAB HOURS		24 Hours

Books:

1. Boylestad, R. L., & Nashelsky, L. (2015). Electronic devices and circuit theory (11th ed.). Pearson.
 2. Hayt, W. H., Kemmerly, J. E., & Durbin, S. M. (2018). Engineering circuit analysis (9th ed.). McGraw-Hill Education.
 3. Sedra, A. S., & Smith, K. C. (2016). Microelectronic circuits (7th ed.). Oxford University Press.
- Malvino, A. P., & Bates, D. J. (2016). Electronic principles (8th ed.). McGraw-Hill Education.