TECHNO INDIA UNIVERSITY

WEST BENGAL

Syllabus

for

4-Years B.Tech.

in

Computer Science and Engineering
(Specialization in Artificial Intelligence)

SEMSTER 2

Career Advancement & Skill Development -I Communication Skill (TIU-HSM-UEN-S11191)

Program: B. Tech. in CSE-AI	**Year, Semester:** 1st Yr., 1st Sem.
Course Title: Career Advancement & Skill Development - I Communication Skill	**Subject Code:** TIU-HSM-UEN-S11191
Contact Hours/Week: 2-0-0 (L-T-P)	**Credit: 2**

COURSE OBJECTIVE:

Enable the student to:

1. Develop English proficiency for clear, precise, and confident workplace communication.
2. Enhance practical skills in vocabulary, grammar, pronunciation, speaking, and writing.
3. Apply communication theories to improve professional and interpersonal interactions.

COURSE OUTCOME :

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

CO-1:	Explain fundamental communication principles and 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 pronunciation drills, vocabulary building, and interactive conversations.	K4
CO-4:	Construct well-organized sentences, paragraphs, and linked 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:	**INTRODUCTION TO COMMUNICATION**	**7 Hours**
Definition of Communication, Importance of Communication in the Workplace, Introduction to Communication Theory, Elements of Effective Communication, Barriers to Communication, Verbal and Non-Verbal Communication, Role of Culture in Communication.		
MODULE 2:	**LANGUAGE AND GRAMMAR SKILLS**	**5 Hours**
Fundamentals of English Grammar, Sentence Structure and Syntax, Parts of Speech, Tenses and their Usage, Common Errors in Grammar, Punctuation and Mechanics, Effective Use of		

Vocabulary, Word Formation and Usage, Formal vs. Informal Language.		
MODULE 3:	**SPEAKING SKILLS**	**8 Hours**
Principles of Effective Speaking, Pronunciation Drills, Sounds of English: Vowels and Consonants, Stress and Intonation, Developing Conversational Skills, Speaking with Clarity and Confidence, Public Speaking Basics, Expressing Opinions and Arguments, Active Listening and Response.		
MODULE 4:	**WRITING SKILLS**	**8 Hours**
The Writing Process: Planning, Drafting, Revising, Editing, Writing Effective Sentences and Paragraphs, Paragraph Development and Coherence, Formal and Informal Writing Styles, Writing Emails and Workplace Documents, Writing Reports and Memos, Common Writing Errors and How to Avoid Them		
MODULE 5:	**PRACTICAL LANGUAGE APPLICATION**	**5 Hours**
Building Vocabulary through Context, Word Choice and Precision, Constructing Grammatically Correct Sentences, Exercises in Sentence Formation, Pronunciation Drills and Accent Neutralization, Role-Plays and Dialogues, Group Discussions and Debates, Writing and Structuring Paragraphs, Linking Paragraphs for Coherent Writing.		
MODULE 6:	**PROFESSIONAL COMMUNICATION IN THE WORKPLACE**	**4 Hours**
Workplace Communication Etiquette, Business Correspondence, Writing Professional Emails, Preparing Presentations, Communicating in Meetings, Handling Workplace Conversations, Persuasive and Negotiation Skills, Overcoming Communication Barriers, Strategies for Effective Workplace Communication.		
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, ISBN9352606108
3. Steven A. Beebe, Susan J. Beebe, and Mark V. Redmond, “Interpersonal Communication: Relating to Others”, Pearson, 2013, ISBN-10: 020586273X, ISBN-13: 978-0205862733.
4. Judee K. Burgoon, Laura K. Guerrero, and Kory Floyd, “Nonverbal Communication”, Routledge, 2016, ISBN-10: 1138121348, ISBN-13: 978-1138121346.
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. Sarah Trenholm and Arthur Jensen, “Interpersonal Communication”, Oxford University Press, 2013, ISBN-10: 0199827504, ISBN-13: 978-0199827503.
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. Mark L. Knapp, John A. Daly, and Frederick P. M. Boster, "Interpersonal Communication Handbook", Sage Publications, 2011, ISBN-10: 1412974747, ISBN-13: 978-1412974745

Mathematics-I (TIU-BS-UMA-T11101)

Program: B. Tech. in CSE-AI	**Year, Semester:** 1st Yr., 1st Sem.
Course Title: Mathematics-I	**Subject Code:** TIU-BS-UMA-T11101
Contact Hours/Week: 3-1-0 (L-T-P)	**Credit:** 4

COURSE OBJECTIVE:

Enable the student to:

1. Analyze and describe the behavior of functions of single and multiple variable, understand sequences and series.
2. Solve systems of linear equations, evaluate eigen values and eigenvectors of square matrices.
3. Analyzing differential equations and finding their solutions.

COURSE OUTCOME:

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

CO-1:	Analyze the behavior and the nature of the curve with calculus of one variable.	K4
CO-2:	Develop a basic understanding of functions of several variables and their properties.	K4
CO-3:	Investigate the solutions of systems of linear equations using Determinants and Matrices.	K4
CO-4:	Evaluate Eigenvalue and vectors of square matrices.	K4
CO-5:	Examine the nature (viz., convergence, divergence) of sequence and series.	K4
CO-6:	Analyze differential equations and investigate solutions.	K4

COURSE CONTENT:

MODULE 1:	**Differential Calculus**	**12 Hours**

Differential Calculus (Functions of one variable): Rolle's theorem (statement only), Cauchy's mean value theorem (Lagrange's mean value theorem as a special case), Taylor's and Maclaurin's theorems with remainders, indeterminate forms, concavity and convexity of a curve, points of inflexion, asymptotes and curvature.

Differential Calculus (Functions of several variables): Limit, continuity and differentiability of functions of several variables, partial derivatives and their geometrical interpretation, differentials, derivatives of composite and implicit functions, derivatives of higher order and their commutatively, Euler's theorem on homogeneous functions, harmonic functions, Taylor's

expansion of functions of several variables, maxima and minima of functions of several variables – Lagrange's method of multipliers.		
MODULE 2:	**Ordinary Differential Equations**	**10 Hours**
Ordinary Differential Equations: Formation of differential equation, First order differential equations - exact, linear and Bernoulli s form, second order differential equations with constant coefficients, method of variation of parameters, general linear differential equations with constant coefficients, Euler's equations, system of differential equations.		
MODULE 3:	**Sequences and Series**	**8 Hours**
Sequences and Series: Sequences and their limits, convergence of series, comparison test, Ratio test, Root test, Absolute and conditional convergence, alternating series, Power series.		
MODULE 4:	**Matrix and Determinant**	**15 Hours**
Matrix and Determinant: Revision of matrix and determinant, rank and nullity, solutions of system of linear equations using Determinants and Matrices; Eigenvalues and eigen vectors, Cayley-Hamilton Theorem, transformation of matrices, adjoint of an operator, normal, unitary, hermitian and skew-hermitian operators, quadratic forms.		
TOTAL LECTURES		**45 Hours**

Books:

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

Introduction to Programming (TIU-ES-UCS-T11101)

Program: B. Tech. in CSE-AI	**Year, Semester:** 1st Yr., 1st Sem.
Course Title: Introduction to Programming	**Subject Code:** TIU-ES-UCS-T11101
Contact Hours/Week: 3–0–0 (L–T–P)	**Credit:** Theory–3

COURSE OBJECTIVE :

Enable the student to:

1. Develop algorithmic problem-solving skills and implement them in C programs.
2. Apply modular programming, recursion, and data structures to create interactive C programs.
3. Utilize advanced C concepts like structures, pointers, and linked lists for efficient programming.

COURSE OUTCOME :

The student will be able to:

CO1:	Analyze algorithmic solutions to problems.	K4
CO2:	Construct algorithms using C programming.	K3
CO3:	Apply interactive input/output, arithmetic expressions, repetitions, decision-making, and arrays in programs.	K3
CO4:	Organize modular C programs using functions, including recursion.	K3
CO5:	Categorize programs using structures, unions, pointers, and linked lists.	K4
CO6:	Utilize file input and output operations in programs.	K3

COURSE CONTENT :

MODULE 1:	**INTRODUCTION TO C LANGUAGE**	**4 Hours**
Character set, Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement, Simple 'C' programs.		
MODULE 2:	**CONDITIONAL STATEMENTS AND LOOPS**	**6 Hours**
Decision making within a program Conditions, Relational Operators, Logical Connectives, if statement, if-else statement. Loops: while loop, do while, for loop, Nested loops, Infinite loops, switch statement, Structured Programming.		
MODULE 3:	**ARRAYS**	**6 Hours**
One dimensional arrays: Array manipulation, Searching, Insertion, and Deletion of an element from an array, finding the largest / smallest element in an array; Two dimensional arrays, Addition/ multiplication of two matrices transpose of a square matrix, Null terminated strings as array of characters, Representation sparse matrice.		
MODULE 4:	**FUNCTIONS**	**7 Hours**
Top-down approach of problem solving; Modular programming and functions; Standard Library of C functions; Prototype of a function Formal parameter list, Return Type, Function call, Block structure; Passing arguments to a Function Call by reference, Call by value, Recursive Functions, Arrays as function arguments.		
MODULE 5:	**STRUCTURES AND UNIONS**	**5 Hours**
Structure variables, Initialization, Structure assignment, Nested structure, Structures and Functions, Structures and arrays: Arrays of structures, Structures containing arrays, Unions.		
MODULE 6:	**POINTERS**	**9 Hours**
Address operators, Pointers type declaration, Pointer assignment, Pointer initialization, Pointer arithmetic, Functions and pointers, Arrays and Pointers, Pointer arrays.		
MODULE 7:	**SELF-REFERENTIAL STRUCTURES AND LINKED LISTS**	**3 Hours**
Creation of a singly connected linked list, traversing a linked list, Insertion into a linked list, Deletion from a linked list.		
MODULE 8:	**FILE PROCESSING**	**5 Hours**

Concept of Files, File opening in various modes and closing of a file, Reading from a file, writing onto a file.	
TOTAL LECTURES	**45 Hours**

Books:

1. B W Kernighan and D.M. Ritchie, The C Programming Language, Prentice Hall of India.
2. K. Venugopal and Sudeep R Prasad, Programming with C, McGraw Hill
3. R G Dromey, How to solve it by Computer, Prentice Hall in India.
4. Jones, Robin and Stewart, The Art of C Programming, Narosa Publishing House
5. A Kenneth, C Problem solving and Programming, Prentice Hall International.
6. H.Scheldt, C: The Complete Reference, 4th Edition, McGraw Hill

Physics (TIU-BS-UPH-T11101)

Program: BTech in CSE-AI	**Year, Semester:** 1st Yr., 1st Sem
Course Title: Physics	**Subject Code:** TIU-BS-UPH-T11101
Contact Hours/Week: 3–1–0 (L–T–P)	**Credit:** 4

COURSE OBJECTIVE:

Enable the student to:

1. Provide a foundational understanding of basic concepts of physics.
2. Develop problem-solving skills and apply the basic concepts of physics in real-world phenomena.
3. Foster critical thinking and analytical skills in applying theoretical knowledge to practical physics problems.

COURSE OUTCOME:

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

CO-1:	Explain and apply the concepts of gradient, divergence, and curl in vector calculus and their applications in mechanics.	K3
CO-2:	Apply the principles of simple harmonic motion, damped and forced oscillations and resonance to real-world acoustical problems.	K3
CO-3:	Describe the principles of interference, diffraction, and polarization, and explain the working of lasers, including population inversion and pumping mechanisms. Also they will be able to state and explain Maxwell's equations and their implications for electromagnetic wave propagation.	K2
CO-4:	Understand and explain the basic principles of wave mechanics, including the Schrödinger equation, probability interpretation, and quantum harmonic oscillators.	K2
CO-5:	Define the key concepts of phase space, macrostates, microstates, and describe	K2

	the statistical distributions like Maxwell-Boltzmann, Fermi-Dirac, and Bose-Einstein.	
CO-6:	Understand the fundamental concepts in solid-state physics (e.g., crystal structure, magnetization, and hysteresis) and thermodynamics (e.g., black body radiation, entropy, and the laws of thermodynamics).	K2

COURSE CONTENT:

MODULE 1:	**MECHANICS**	**6 Hours**
Vector Calculus- gradient, divergence, curl; Frame of references, Mechanics of a single particle - conservative and non-conservative forces, potential energy function F= -grad V		
MODULE 2:	**ACCOUSTICS**	**5 Hours**
Simple harmonic oscillator, damped and forced motion and resonance; wave motion and equation.		
MODULE 3:	**OPTICS**	**7 Hours**
Interference - overview of interference phenomena, interference due to thin films- Newton's ring; Diffraction - single slit, double slit and grating; Polarization: introduction, polarization by reflection, scattering of light, circular and elliptical polarization, optical activity; Lasers - principle and working of laser, population inversion, pumping, various modes, threshold population inversion with examples.		
MODULE 4:	**ELECTROMAGNETISM**	**4 Hours**
Introduction (qualitative discussion), Maxwell's equations, wave equation, plane electromagnetic waves, Poynting's theorem.		
MODULE 5:	**WAVE MECHANICS**	**7 Hours**
Introduction to quantum physics, wave functions and Schrodinger equation, probability interpretation, particle in a 1D box, quantum harmonic oscillator, Hydrogen atom problem.		
MODULE 6:	**STATISTICAL MECHANICS**	**6 Hours**
Qualitative ideas about phase space, macrostates and microstates, density of states, qualitative discussion on Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein Statistics.		
MODULE 7:	**SOLID STATE PHYSICS**	**6 Hours**
Introduction of crystal structure, Bragg's law; Properties and applications of dielectric materials, Magnetisation- permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.		
MODULE 8:	**THERMAL PHYSICS**	**3 Hours**
Black body radiation, 1st and 2nd law of thermodynamics, concept of entropy.		
	TOTAL LECTURES	**45 Hours**

Books:

1. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India Learning Private Limited
2. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education private limited
3. Engineering Physics , Dattuprasad Ramanlal Joshi, McGraw Hill Education private limited

4. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles,Robert Eisberg, Robert Resnick, Wiley
5. Statistical Physics, L.D. Landau, E M.Lifshitz, Butterworth-Heinemann
6. Optics,Ghatak, McGrawHill Education India Private Limited
7. Engineering Physics , Hitendra K Malik & A K Sing, McGraw Hill Education private limited
8. Advanced Acoustics, Dr. D.P. Raychaudhuri, The new bookstall, Revised Ninth Edition, 2009
9. Concepts of Modern Physics (Sixth Edition) by Arthur Beiser (Published by McGraw-Hill).
10. Introduction to Solid State Physics (January2019) by Charles Kittel (Published by Wiley)

Physics Lab (TIU-BS-UPH-L11101)

Program: B.Tech in CSE-AI	**Year, Semester:** 1st Yr, 1st Sem
Course Title: : Physics Lab	**Subject Code:** TIU-BS-UPH-L11101
Contact Hours/Week: 0–0–3(L–T–P)	**Credit:** 1.5

COURSE OBJECTIVE :

Enable the student to:

1. Provide hands-on experience with experimental techniques in optics, electricity, and mechanics
2. Develop a strong understanding of the fundamental physical constants and properties of materials
3. Enhance students' problem-solving and analytical skills through real-world applications

COURSE OUTCOME:

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

CO-1:	Develop hands-on skills in setting up experimental apparatus and accurately measuring physical quantities.	K3
CO-2:	Analyze experimental data using appropriate methods, interpret results, and assess the reliability and accuracy of measurements.	K4
CO-3:	Correlate theoretical physics principles with experimental observations to understand real-world applications.	K5
CO-4:	Demonstrate the ability to troubleshoot experimental issues and make informed decisions to optimize accuracy.	K5
CO-5:	Document experiments systematically and effectively present results, including calculations and error analysis.	K6
CO-6:	Work collaboratively in a lab environment, maintaining safety protocols and contributing to group discussions and analysis.	K6

COURSE CONTENT :

MODULE 1:	**EXPERIMENT : 1**	**3 Hours**
To determine the wavelength of a monochromatic light by Newton's ring		
MODULE 2:	**EXPERIMENT : 2**	**3 Hours**

To determine the dispersive power of a prism		
MODULE 3:	**EXPERIMENT : 3**	**3 Hours**
To determine the unknown resistance by Carey-Foster bridge		
MODULE 4:	**EXPERIMENT : 4**	**3 Hours**
Determination of e/m ratio of electron by J.J. Thomson method		
MODULE 5:	**EXPERIMENT : 5**	**3 Hours**
Determination of Plank's constant using photoelectric effect		
MODULE 6:	**EXPERIMENT : 6**	**3 Hours**
To determine the refractive index of water using travelling microscope		
MODULE 7:	**EXPERIMENT : 7**	**3 Hours**
To determine the Young's modulus/bending moment of a beam by flexure method		
MODULE 8:	**EXPERIMENT : 8**	**3 Hours**
To determine the rigidity modulus of a wire by dynamic method		
MODULE 9:	**EXPERIMENT : 9**	**3 Hours**
To determine the viscosity of water by capillary tube method		
MODULE 10:	**EXPERIMENT : 10**	**3 Hours**
To determine the thermal conductivity of a bad conductor by hot wire method		
MODULE 11:	**EXPERIMENT : 11**	**3 Hours**
Study of B-H loop of a magnetic material		
MODULE 12:	**EXPERIMENT : 12**	**3 Hours**
Study of electrical resistivity of metal and semiconductor by four probe method		
Total Hours (Any seven experiments to be performed)		**21 Hour**

Books:

1. Laboratory Manual
2. Advanced Practical Physics (Volume I and II) for BSc Physics Lab, B. Ghosh & K.G Mazumdar
3. An advanced course in practical physics by D . Chattopadhyay and P.C Rakshit, New central agency(P)Ltd.

Introduction to Programming Lab (TIU-ES-UCS-L11101)

Program: B. Tech. in CSE-AI	**Year, Semester:** 1st Yr., 1st Sem
Course Title: Introduction to Programming Lab	**Subject Code:** TIU-ES-UCS-L11101
Contact Hours/Week: 0–0–3 (L–T–P)	**Credit:** 1.5

COURSE OBJECTIVE

Enable the student to:

1. Introduce students to the fundamentals of C programming, including syntax, data types, operators, and control structures, enabling them to write and execute basic programs.
2. Develop students' ability to analyze problems, apply algorithmic thinking, and implement solutions using decision-making constructs, loops, functions, and data structures.

3. Equip students with hands-on experience in using arrays, strings, pointers, structures, and unions, enabling them to develop efficient programs for mathematical computations, data processing, and real-world applications.

COURSE OUTCOME

CO-1	Demonstrate the ability to write, compile, and execute simple C programs using basic input-output functions, arithmetic operations, and control statements.	K2
CO-2	Apply conditional statements (if-else, ternary operator, switch-case) and looping constructs (for, while, do-while) to solve mathematical and logical problems.	K3
CO-3	Solve mathematical problems such as factorial, permutations & combinations, series summation, and trigonometric computations using C programming.	K3
CO-4	Develop programs using arrays and strings to perform operations such as searching, sorting, frequency analysis, and string transformations.	K4
CO-5	Utilize pointers, structures, and unions in C to perform complex operations such as matrix manipulations, complex number arithmetic, and data organization.	K4
CO-6	Implement user-defined functions and demonstrate the ability to use memory management functions, pointers, and structures for efficient data handling.	K4

COURSE CONTENT

MODULE 1:	**Introduction to C Programming & Basic Operations**	**6 Hours**
Writing and executing a basic C program (Hello World). Understanding Input/Output functions (printf(), scanf()). Variables, Data Types, and Memory Allocation. Arithmetic operations and simple mathematical computations		
MODULE 2:	**Control Structures & Decision Making**	**6 Hours**
Conditional statements (if-else, ternary operator, switch-case). Looping constructs (for, while, do-while). Nested control structures.		
MODULE 3:	**Functions, Recursion & Pattern Printing**	**6 Hours**
Defining and calling user-defined functions. Function parameters, return types, and recursion. Printing patterns using loops (*, numbers, alternating 0/1). Mathematical computations using recursion (Factorial, nCr).		
MODULE 4:	**Arrays & Strings**	**9 Hours**
One-dimensional and two-dimensional arrays. Searching & sorting algorithms. String operations		

(length, frequency analysis, conversion to uppercase/lowercase).		
MODULE 5:	**Pointers, Structures & Memory Management**	**9 Hours**
Pointer concepts and memory addresses. Pointer arithmetic and array manipulation using pointers. Structures and Unions for data organization. Dynamic memory allocation concepts.		
MODULE 6:	**Advanced Programming & Applications**	**9 Hours**
Matrix operations (Addition, Multiplication). Trigonometric function computations (sin, cos values at intervals). File handling concepts (basic read/write operations).		
	TOTAL LAB HOURS	**45 Hours**

Books:

1. B W Kernighan and D.M. Ritchie, The C Programming Language, Prentice Hall of India.
2. K. Venugopal and Sudeep R Prasad, Programming with C, McGraw Hill
3. R G Dromey, How to solve it by Computer, Prentice Hall in India.

Engineering Drawing and Graphics (TIU-ES-UME-L11191)

Program: B. Tech in CSE-AI	**Year, Semester:** 1st year, 1st Semester
Course Title: Engineering Drawing and Graphics	**Subject Code:** TIU-ES-UME-L11191
Contact hours/week: 0-0-3 (L-T-P)	**Credit:** 1.5

COURSE OBJECTIVE:

Enable the student to:

1. Develop an understanding of the fundamental concepts and significance of engineering drawing in various engineering disciplines.
2. Acquire skills to construct and analyze engineering curves, projections of points, lines, planes, and solids.
3. Learn to interpret and create orthographic and isometric projections using conventional and computer-aided drafting techniques.
4. Gain proficiency in using drafting software for preparing accurate engineering drawings.

COURSE OUTCOME:

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

CO-1:	Understand the fundamental principles and scope of engineering drawing across various engineering disciplines.	K2
CO-2:	Demonstrate proficiency in constructing and analyzing different engineering curves.	K3
CO-3:	Apply projection techniques for points, lines, planes, and solids in different orientations.	K3
CO-4:	Develop skills to create orthographic and isometric projections accurately.	K3

CO-5:	Interpret and convert between pictorial, orthographic, and isometric views of objects.	K3
CO-6:	Utilize computer-aided drafting tools to create precise engineering drawings.	K3

COURSE CONTENT :

MODULE 1:	**Introduction**	**6 Hours**
Scope of Engineering Drawing in all Branches of Engineering, Uses of Drawing Instruments and Accessories, Types of Arrowheads, Lines, Dimension System, Representative Fraction, Types of Scales (plain and Diagonal Scale).		
MODULE 2:	**Engineering Curves**	**6 Hours**
Classification of Engineering Curves, Application of Engineering Curves, Constructions of Engineering Curves (Conics-ellipse; parabola; hyperbola with Tangent and Normal).		
MODULE 3:	**Projection of Points and Straight Lines**	**9 Hours**
Types of Projections - Oblique, Perspective, Orthographic and Isometric Projections; Introduction to Principal Planes of Projections, Projections of Points located in all four Quadrants; Projections of lines inclined to one of the Reference Plane and inclined to two Reference Planes.		
MODULE 4:	**Projections of Planes and Solids**	**9 Hours**
Projections of various planes (Polygonal, Circular, Elliptical shape inclined to one of the reference planes and two of the reference planes) and Projections of Solids (cube, prism, pyramid, cylinder, cone and sphere).		
MODULE 5:	**Orthographic Projections & Isometric View/Projections**	**8 Hours**
Projections on Principal Planes from Front, Top and Sides of the Pictorial view of an Object, First Angle Projection and Third Angle Projection system; Full Sectional Orthographic Views, Conversion of Orthographic Views into Isometric Projection, View or Drawing; Isometric Scale.		
MODULE 6:	**Overview of Computer Aided Drafting Tools**	**1 Hours**
Introduction to Computer Aided Drafting Software; Basic Tools; Preparation of Orthographic Projections and Isometric Views Using Drafting Software.		
	TOTAL LAB HOURS	**39 Hours**

Books:

Main Reading:

1. Jolhe, Dhananjay A, Engineering Drawing an introduction to AutoCAD, Tata McGraw-Hill.
2. N.D. Bhatt, Engineering Drawing, Charotar Publishing House Pvt. Ltd.

Basic Computing Lab (TIU-ES-UCS-L11191)

Program: B. Tech. in CSE-AI	**Year, Semester:** 1st Yr., 1st Sem.

Course Title: Basic Computing Lab	**Subject Code:** TIU-ES-UCS-L11191
Contact Hours/Week: 0–0–2 (L–T–P)	**Credit:** 1

COURSE OBJECTIVE:

Enable the student to:

1. To introduce students to the UNIX/Linux environment and familiarize them with fundamental system operations, commands, and file management techniques.
2. To develop proficiency in shell scripting and command-line utilities for automating tasks, managing processes, and handling files efficiently.
3. To provide hands-on experience with GitHub operations and debugging techniques while enhancing students' ability to work with text processing tools, redirection, and file compression in a UNIX/Linux environment.

COURSE OUTCOME:

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

CO-1	Be Familiar with the UNIX/Linux operating system	K2
CO-2	Develop proficiency in using shell commands and writing basic shell scripts.	K3
CO-3	Understand file systems, process management, and user permissions.	K2
CO-4	Understand basic github operations and debugging of programs	K3
CO-5	Apply fundamental text processing tools and commands such as grep, find, and text editors (vi/nano) for efficient file manipulation and searching.	K4
CO-6	Utilize redirection, piping, and file compression techniques to manage data effectively in a UNIX/Linux environment.	K4

COURSE CONTENT :

MODULE 1:	**INTRODUCTION TO UNIX/LINUX AND BASIC COMMANDS**	**9 Hours**
Overview of UNIX/Linux operating systems, Logging into UNIX/Linux systems, Basic system commands: ls, cd, pwd, cp, mv, rm, clear, man, who, date, cal, etc. Understanding the file system hierarchy: /, /home, /bin, /usr, /var, etc.		
MODULE 2:	**FILE AND PROCESS MANAGEMENT**	**9 Hours**
File and Directory Management: Creating, removing, and organizing files and directories, Commands: mkdir, rmdir, touch, chmod, chown, rm, find, etc. Understanding file permissions and ownership (rwx permissions, chmod command) Process Management: Viewing active processes (ps, top, htop), Controlling processes: kill, bg, fg, jobs, nice, and renice,Understanding process states: running, sleeping, zombie.		
MODULE 3:	**TEXT PROCESSING AND BASIC SHELL SCRIPTING**	**9 Hours**
Text Editors (vi, nano): Creating, editing, saving, and existing files, Working with commands like grep, cat, more, less, sed, and awk Basic Shell Scripting: Writing simple shell scripts (bash), Understanding variables, loops (for, while), and conditional statements (if, elif, else), Creating automation scripts for file operations and system monitoring		

MODULE 4:	REDIRECTION, PIPING, AND FILE COMPRESSION	9 Hours
Redirection and Piping: Input/output redirection (>, >>, <) Piping (|) for command chaining File Compression and Archiving: Working with gzip, tar, zip, unzip,Creating and extracting archives for data backup		
MODULE 5:	**GITHUB BASICS AND DEBUGGING TECHNIQUES**	**9 Hours**
Using GitHub for Version Control: Setting up a GitHub repository, Basic commands: git init, git add, git commit, git push, git pull, git clone,Checking in and checking out files Debugging Techniques: Identifying and resolving errors in shell scripts, Using debugging tools (echo, set -x, gdb for C programs)		
	TOTAL LAB HOURS	**45 Hours**

Books:

1. "UNIX and Linux System Administration Handbook" – Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, and Dan Mackin
2. "The Linux Command Line: A Complete Introduction" – William E. Shotts Jr.

"Learning the bash Shell"– Cameron Newham.

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. 2nd 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., 2nd 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. Aanalyze 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

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.Sourceconversion, 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 ofsystem 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-phloads, measurement of 3-ph power.		
MODULE 6:	**SEMICONDUCTOR DEVICES**	**6 Hours**
Energy bands in solids.Intrinsic and extrinsic semiconductors.P-N junctions. Semiconductor diodes: ZenerandVaractor 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 phasetransformer: voltage and current transformation, no-load operation, voltage		

regulation on resistive load.	
TOTAL LECTURES	**45 Hours**

Books:

1. D. Chattopadhyay, P. C. Rakshit, Funndamentals 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:** 1st Yr., 2nd 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:** 1st Yr., 2nd Sem.
Course Title: Basic Electrical Engineering Lab and Simulation	**Subject Code:** TIU-ES-UEE-L12101
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.
4. Malvino, A. P., & Bates, D. J. (2016). Electronic principles (8th ed.). McGraw-Hill Education.